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MARCH, 1959

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PMM

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS

EXTRUSIONS

INVESTMENT CASTINGS

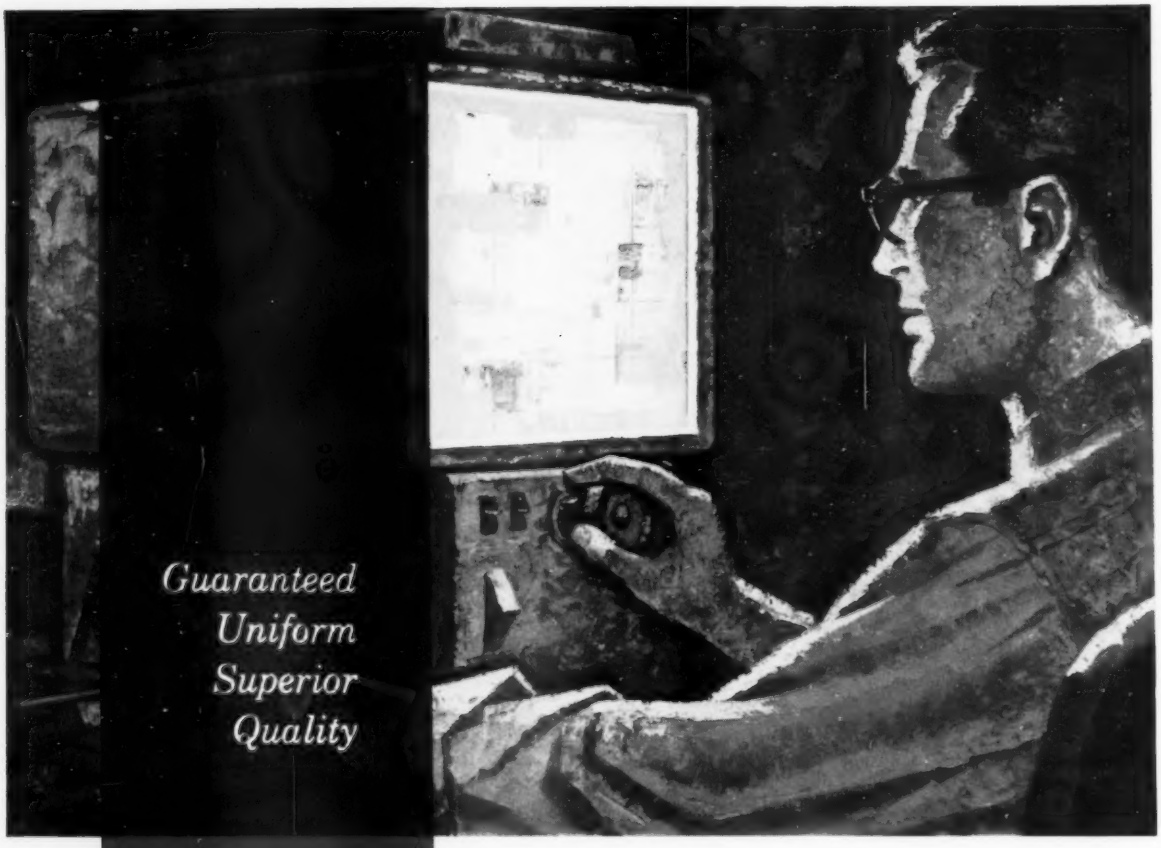
PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

SINTERINGS

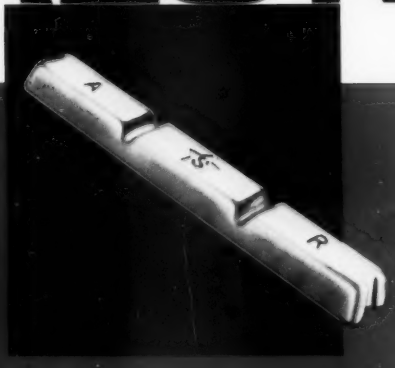
SHELL MOLD CASTINGS

"A properly designed sintered hub will withstand a torque load of 675 ft. lbs." — G. R. Pierce see page 3



ALUMINUM

ALLOYS



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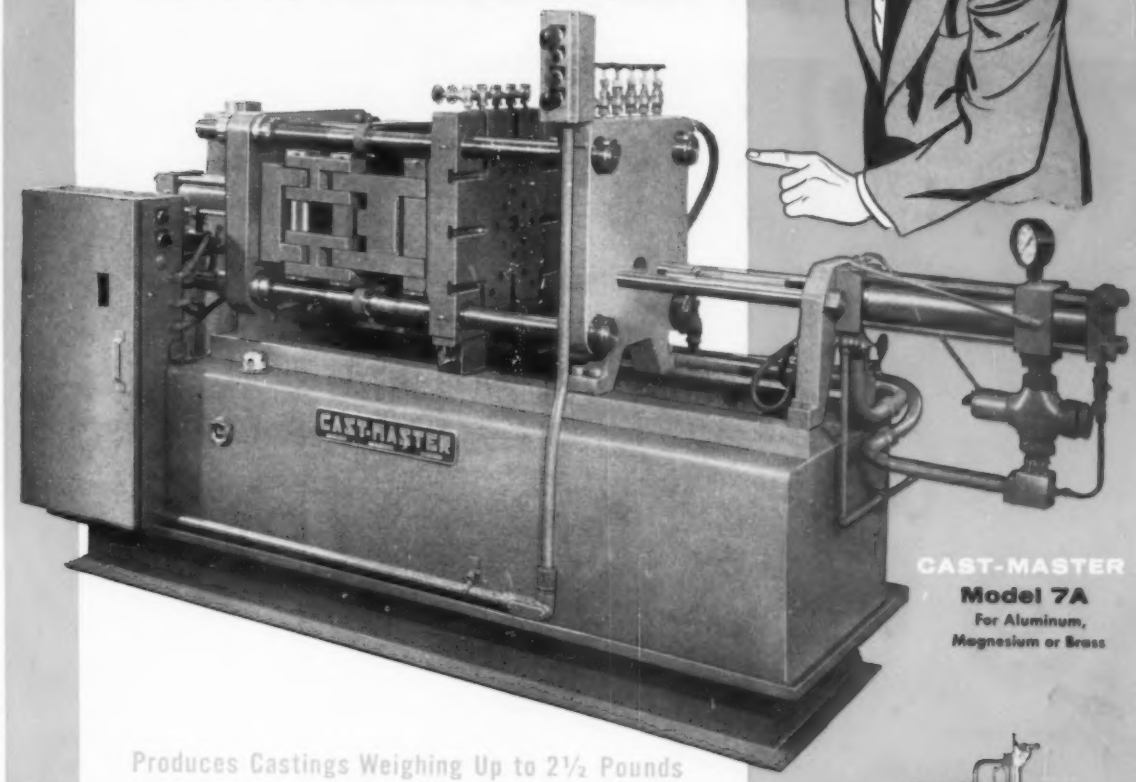

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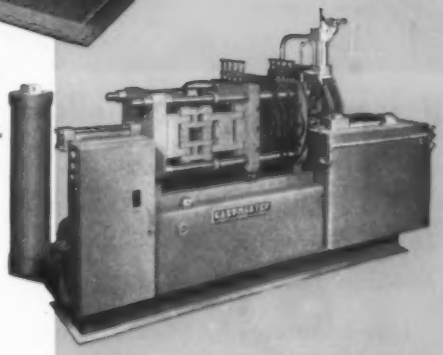

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IN THIS ISSUE

March, 1959: Volume 17 Number 3

COVER

USE SINTERINGS UNDER HIGH STRESS? It can be done if the design is right. Careful design coupled with the know-how of a good custom fabricator can give a part which will do your job with an adequate safety factor and, at the same time, cut your production costs to the bone. G. R. Pierce, chief engineer (left) and Wm. K. Becker, sales engineer (right) are shown on our cover studying the sintered hub described in the article starting on page 29.

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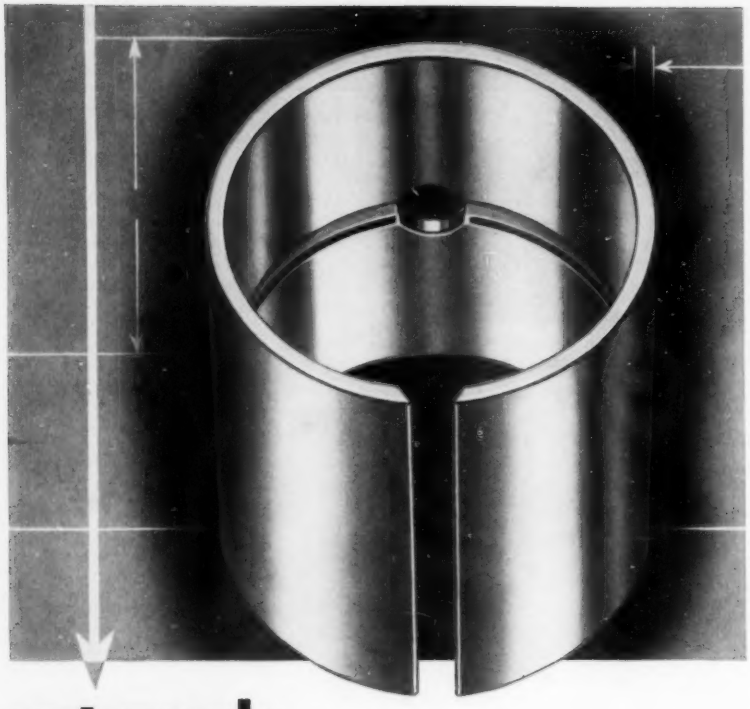

extremely rigid specifications!

The illustration shows the cast bronze spindle bearing of a very well-known and popular metal-working lathe.

The manufacturer of this lathe has extremely rigid specifications covering tolerances, finish, structural quality of the bronze and roundness of the bearing even though the bearing is split for its entire length.

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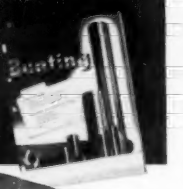

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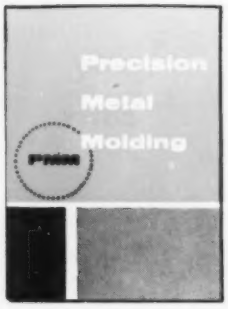

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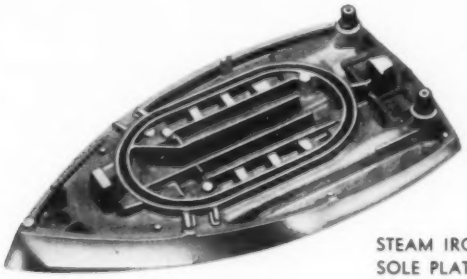
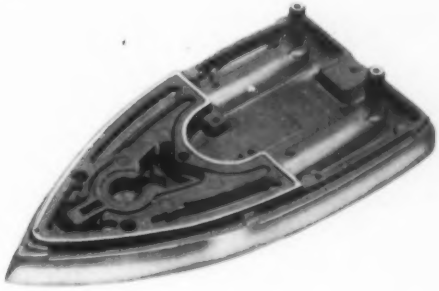
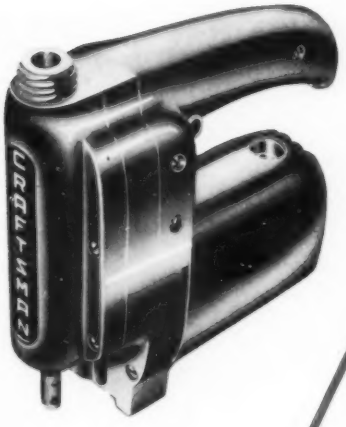




STEAM IRON SOLE PLATES



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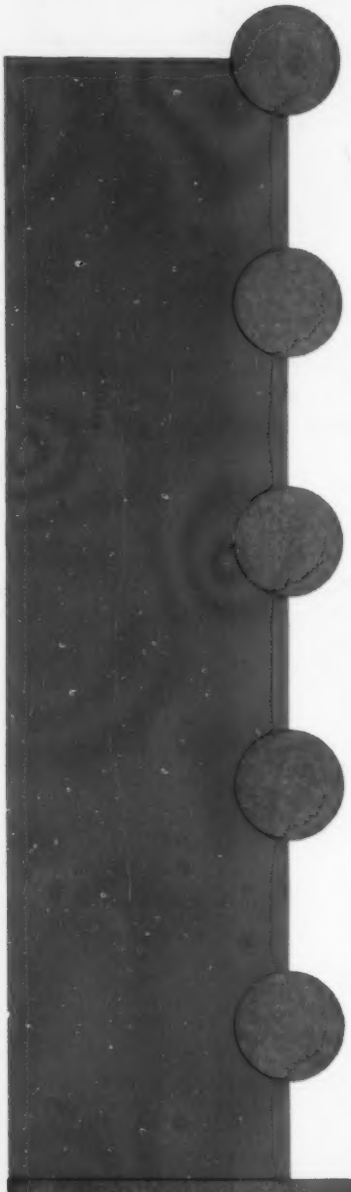
60 CYCLE INDUCTION MELTING



A famous metallurgist once wrote: "50% of all rejects can be traced to faulty melting and pouring." When molten metal is overheated, important alloy ingredients are lost by burning. Castings or billets may be porous from combustion gases absorbed by the molten metal. Frequently, unwanted alloy ingredients are picked up from the containers used in melting. If the temperature of molten metal flowing into a mold strays from the optimum, defective castings will result. In a quiet melt alloy ingredients may not dissolve properly, and the metal cast will not meet specifications. Finally, there is the problem of nonmetallics suspended in the melt which cause occlusions and other difficulties in the end product.

60 CYCLE INDUCTION MELTING, properly applied, is probably the biggest single step that can be taken to overcome these traditional melting problems. The method is unique in its combination of two factors: Heat is generated only in the molten metal, and the entire melt is stirred by electromagnetic pressure. Furthermore, high melting rates can be concentrated in a small space. —No part of the furnace is hotter than the metal. Combustion gases are absent and controlled atmospheres can be used. The container is constructed of refractories inert to the molten metal. Temperature control of unprecedented precision is inherent in the method. Electromagnetic stirring assures complete dissolving of all ingredients and a uniform alloy. Suspended nonmetallics are deposited in the electromagnetic pressure area.

These are basic reasons why 60 CYCLE INDUCTION MELTING has had such a spectacular growth in the postwar period. Modern plants require high production rates with controlled quality, yet can assign only a minimum of skilled labor to each operation. 60 CYCLE INDUCTION MELTING minimizes hard labor in melting. It enables process control to substantially decrease the effect of human error. Cost reductions are reflected throughout each step of fabrication of a casting or billet to its end use.

60 CYCLE INDUCTION MELTING, firmly established for thirty years as the predominant production method for melting brass, has recently been applied on a much larger scale. In the last ten years, as new furnace designs became available, the method has been rapidly adopted by many progressive companies in the fields of aluminum die casting, aluminum extrusion, aluminum wire, aluminum coating, leaded copper alloy casting, zinc die casting, and galvanizing of strip in the steel mills. Well over one thousand 60 CYCLE INDUCTION MELTING furnaces are now operating in these new fields.

Our 60 CYCLE INDUCTION MELTING furnace takes many different forms to meet the needs of all these industries. Unit production rates now range from 150 pounds to 40 tons per hour. We specialize in the development, design, and manufacture of standard and custom-built furnaces to meet each requirement. If there is a production melting problem in your operation which may benefit from a basic change in method, we should be glad to discuss the possibilities with you.

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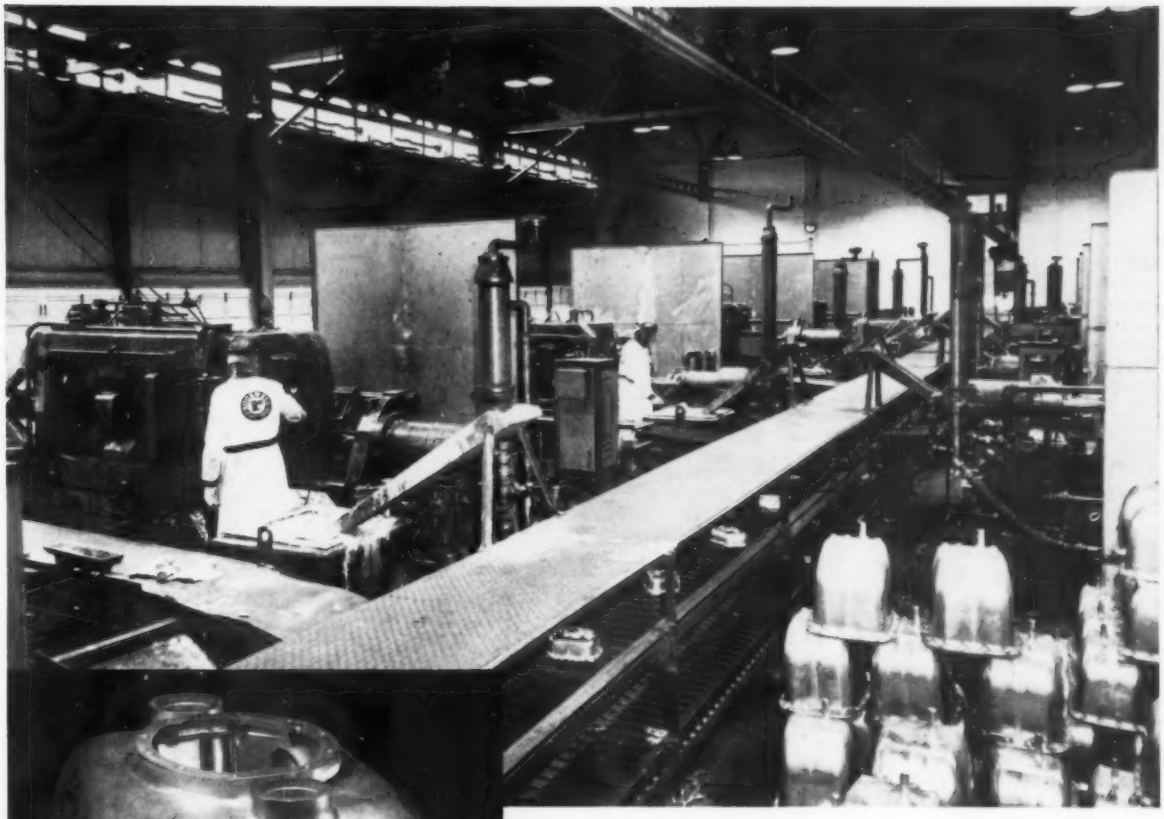

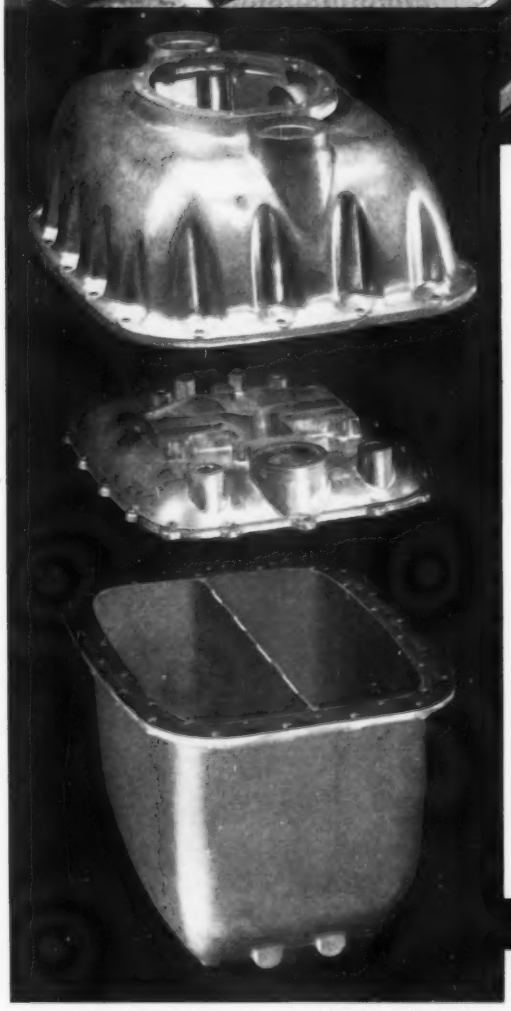

"LESTERS take the human element out of die casting operations"

Since aluminum meter die castings must be pressure proof and free of porosity and of a special alloy, Rockwell Manufacturing Company had a problem to secure high grade castings in production quantities. This was especially true of the Rockwell 700-800 Gas Meter parts (shown at left) which were very difficult to cast. One part alone weighs 16 lbs. 12 oz., machined—measures 13-1/2″ x 16″ x 12-11/16″ deep—and is required to stand 40 lbs. of air pressure under water at 110 degrees.

This part is now produced by a $23,000 die run in an 800 ton Lester Machine with a 30″ die movement, automatically ladled, at Rockwell's Plant in Russellville, Kentucky.

It is the opinion of Jack Whipple, Die Cast Supt. at the Russellville Division of Rockwell Manufacturing Company, that with the speed and pressure you get from a Lester Machine, it is possible to eliminate a lot of human error in die casting. Therefore, it takes less experienced operators to produce the high quality necessary for Rockwell products.

Rockwell is operating 19 Lester Die Casting Machines at its 106,000 sq. ft. air conditioned Die Cast Plant at Russellville.

If you are interested in making quality die castings, write for complete information on Lester Die Casting Machines.

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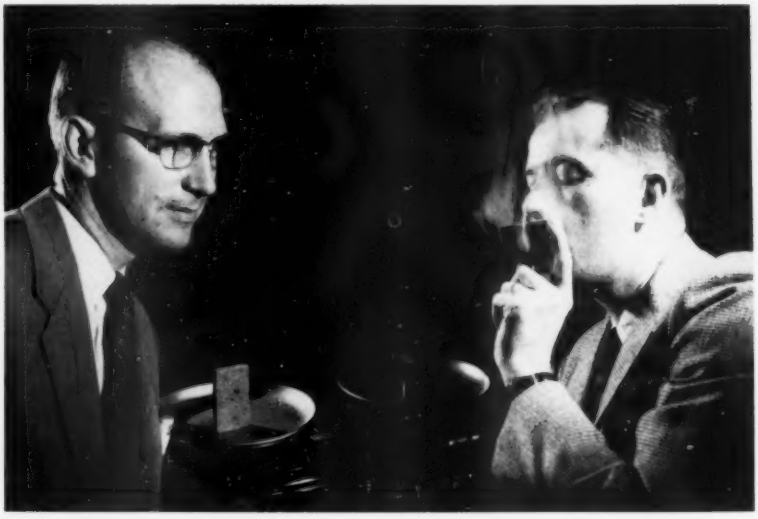
CASTING ABOUT

technical news of applications & processes involving precision metal moldings

ONE NINTH THE WEIGHT of solid metal, but still all metal and both rigid and strong. That's the description of a new material developed in the Flight Propulsion Laboratory of General Electric Co. This "F-Metal", as it is presently called, is made in much the same fashion as a loaf of bread. The ingredients are carefully mixed, put in a pan and then baked in an oven. During the baking process the "bread" rises. The final loaf is rigid, low density material, so light and porous that cigarette smoke passes through it easily.

While still in the experimental stage, foamed nickel, copper and cast iron have already been made and other metals will be added to the list.

What can the foam be used for? Its value in jet engines has already been demonstrated in lighter weight so that a greater fuel load can be carried and in making closer tolerances possible inside a jet engine.



AUTOMOBILES ARE GETTING BIGGER AND HEAVIER every year. The increased weight is giving engineers and designers an ever bigger headache. Part of their answer is found in a wider use of aluminum components. The market research bureau of Aluminum Co. of America has come up with some figures which show this continuing growth. Figures for the average weight of aluminum used in automobiles over the past several years are:

1954	25.0 pounds
1955	29.6 pounds
1956	35.2 pounds
1957	40.5 pounds
1958	47.3 pounds
1959 (est)	51.6 pounds

This is over a 100% increase in only six model years and present indications are that this is only a beginning.

For example, here are some of the estimates for 1959.

Company	Aluminum in standard car	Automatic Transmission	Power Brakes Power Steering Transmission	Total pounds per car (composite)
GMC	21.59	36.49	55.17	42.33
Ford	36.07	67.12	71.39	60.03
Chrysler	33.17	68.95	79.13	68.92
Amer. Motors	39.63	57.38	65.90	49.91
S-P Corp.	9.63	30.85	30.56	18.66
Total for industry	28.77	53.75	62.53	51.58

Based on an estimated model year production of 5.5 million cars the industry will consume in excess of 283 million pounds of aluminum.

COMMERCIAL PRODUCTION OF TITANIUM CASTINGS has started at Harvey Aluminum, one of two companies capable of making these castings commercially.

Harvey uses a closed, consumable electrode furnace with either an inert atmosphere or vacuum maintained to protect the metal from oxidation or solution of undesirable gases. Castings made under these conditions show improved ductility, lower hardness and freedom from hard inclusions. Machining is much easier than when the metal is melted in a carbon or tungsten arc.

The titanium castings are used where high resistance to corrosion is required and/or favorable strength to weight ratio. As cast, the parts have reasonable dimensional accuracy, good impact resistance and good ductility.

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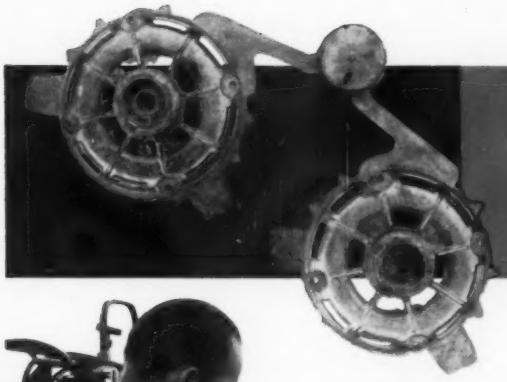


to die cast aluminum motor end-bells . . .

ABOVE: Operator removing end-bell casting from one of Emerson-Electric's new Model 400-N Clevelands. End-bell is 6¼" in dia. Weight of shot approx. 2½ lbs. A close-up view of the "as-cast" part is also shown.

BELOW: Cleveland Model 400-N with aluminum shot end. Also available as a hot chamber, zinc machine. Has 36"x40" die plates; 400-tons locking pressure, **strain gage tested.**

EMERSON-ELECTRIC AGAIN SELECTS MODEL 400-N

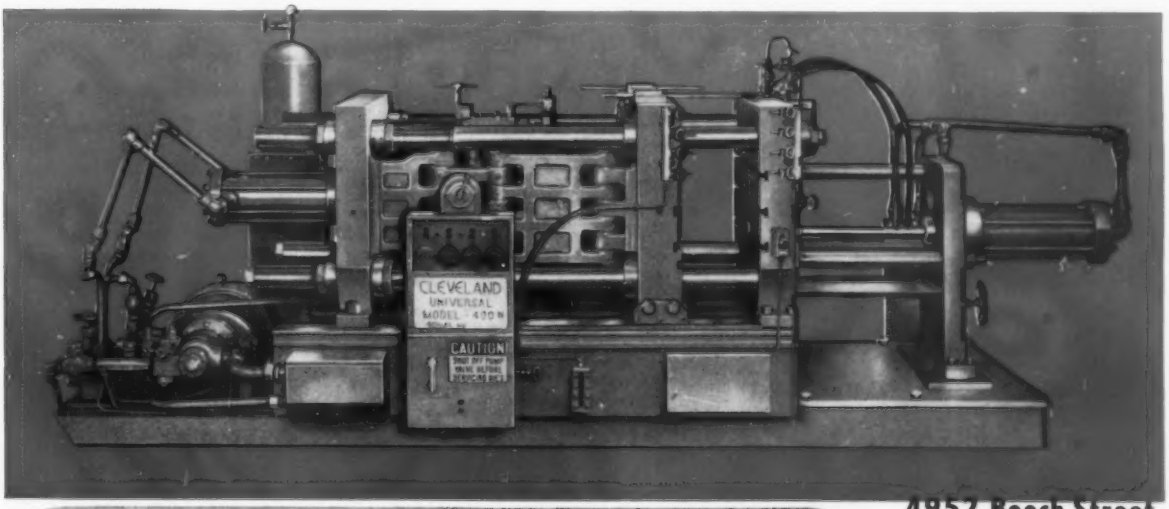
CLEVELANDS

The Emerson Electric Mfg. Co., manufacturer of Emerson-Electric motors and appliances, operates two Model 400-N Clevelands in their St. Louis plant, to cast aluminum motor end-bells.

Based on the excellent performance of these Clevelands, Emerson-Electric has recently installed *two more* Model 400-N Clevelands in their new, modern plant at Paragould, Ark. These new Clevelands are also producing aluminum end-bells in two-cavity dies.

For the Paragould installation, the new Model 400-N's were built as "right-hand" and "left-hand" machines; are located shot end-to-shot end. One operator controls both machines, ladling from a central furnace.

The nation's leading producers of die castings rely on *Clevelands* for dependable, profitable performance. Investigate their advantages for *your* production. Built in 50, 200, 400 and 600 ton capacities, for zinc and aluminum casting. For machine specifications, write for new Bulletin No. 5246.



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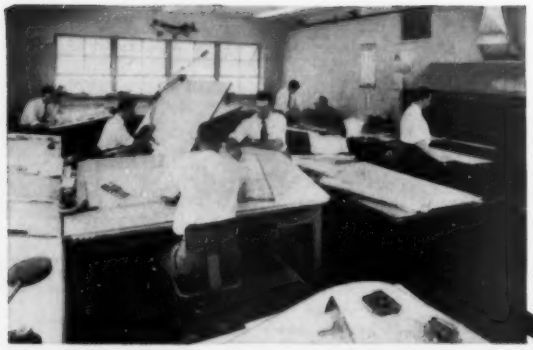

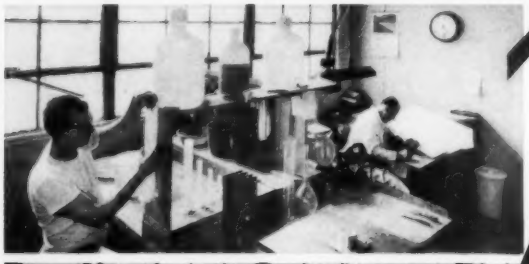

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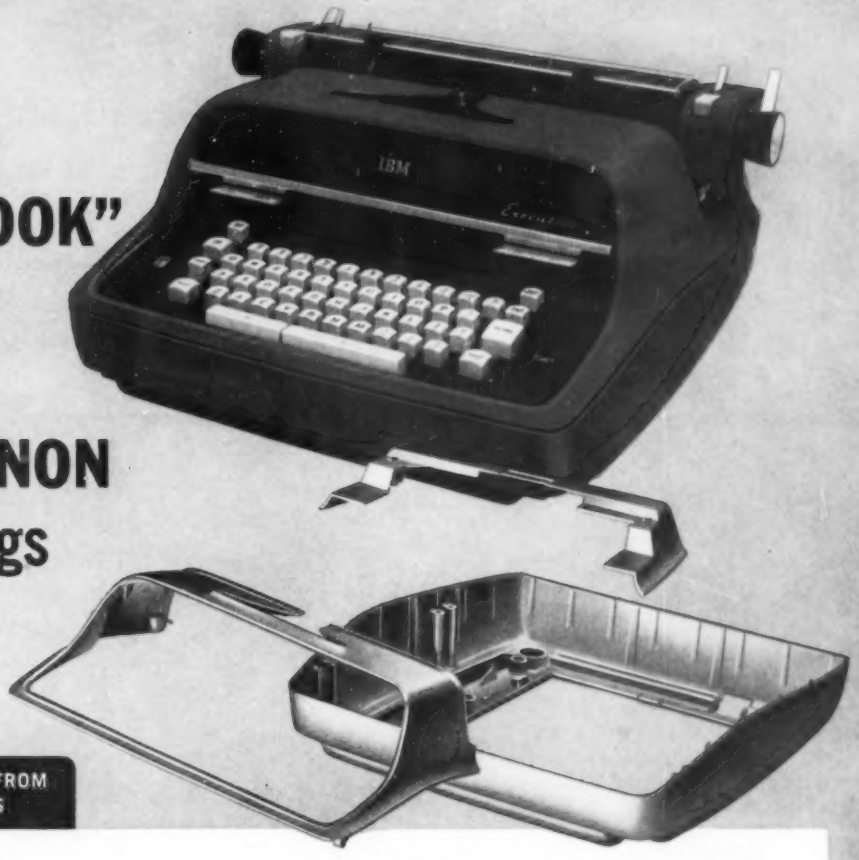

CASE HISTORIES FROM MT. VERNON FILES

Behind the sleek silhouette of the dramatically new IBM electric typewriters is "more than a quarter of a century of experience . . . a combination of styling and engineering advances" that promise — and deliver — better performance and easier typing.

For its enclosure IBM knew what it wanted: a new high in eye-pleasing design combined with the many low cost, production benefits of die-casting. It was only natural that, for these die castings, once again, they turned to Mt. Vernon, a reliable supplier to IBM for over 25 years.

And, once again, they found Mt. Vernon's coordinated four-fold service — designing, die making, casting, and machining—equal to the job of meeting their strict requirements: strong, gracefully arched, thin-walled, large aluminum sections that match and fit perfectly. The three castings that cradle and enclose the intricate typewriter mechanism are delivered completely machined, ready for finishing.

Like IBM, leading manufacturers in all industries know and rely on Mt. Vernon's experienced use of its complete facilities for die cast zinc and aluminum parts ready for assembly. These services, all under one roof in 200,000 square feet of space, may hold the answer to your design and production problems. Think about it . . . and let us know. We'll gladly talk it over, without obligation. Just call your nearest Mt. Vernon sales representative.

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SAVE MONEY ON YOUR DIE CASTING DIES

D-M-E Standards can save you time and money on every die with less initial cost and longer die life.

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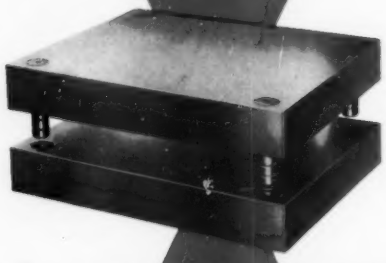

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LETTERS

the readers' forum

DIE CASTING DIRECTORY

We are in receipt of the January 1959 issue of PRECISION METAL MOLDING which includes the 3rd Annual Diecasting Directory.

As a diecaster, we would appreciate very much your advising, at your convenience, how we may have our firm listed in your next annual directory. H.G.W. – purchasing agent

When the directory is being prepared, we send questionnaires to all die casting establishments. Those companies who fill in the needed information and return the questionnaire to us are listed. No company is ever listed unless we have written evidence, from them, that they are a custom die caster. The few new companies who start in business after publication of the directory can be assured of a listing in the next directory by notifying us of their existance. In due time, then, they will receive a questionnaire. Ed.

ERRATUM

In the December, 1958 issue of PRECISION METAL MOLDING the article on the Ford Motor Co. plant near Muscle Shoals, Ala. contains an error in the caption to figure 6. The automatic ladling units are Lindberg Autoladles, not Ajaxomatic units as printed. – D.C.

Sorry – Ed.

CORROSION PROTECTION

In PRECISION METAL MOLDING for December, 1957 on page 55, a technical report mentions that chromate conversion coating resists exceedingly severe test conditions. Since we have been investigating and using these coatings we are interested in knowing more about the source of your information, particularly since we cannot obtain the corrosion resistance you mention.

Information on this subject would be very helpful and perhaps we can ask for your assistance in finding out where the tests were made. J. F. C. – Chief Chemist.

Much of the information on chromate conversion coatings in this report was furnished by Allied Research Products Co., Baltimore, Md. Complete information on test methods, test locations and results can be secured from that company. – Ed.

DIE CAST ENGINE BLOCKS

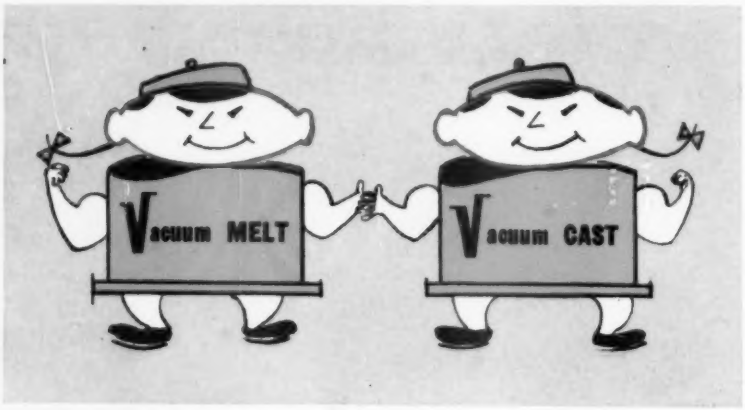
In your issue of February, 1958, you published an article: DIE CASTING A "V" TYPE ENGINE BLOCK.

We would like another copy of that article as we have sent our copy to our principals in France. F.R. – Production Management Engineer, Renault, Inc.

UNDER WATER MOLDS

On page 64, January issue of PRECISION METAL MOLDING, there is an inquiry from one of your readers concerning a material that will set under water and which could be used for making molds of damage structures. We have an Epoxy Resin developed specifically for under water use, and which I am quite sure will solve

continued on page 74



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A technique to enhance the properties of metals demanded by the aircraft, missile and space age vehicles.

"DOUBLE V" signifies the manufacture of cast components using *vacuum melted primary* ingots subsequently *remelted, poured in vacuum,* using investment or MONO-SHELL molds.

Misco engineers have designed vacuum equipment which permits continuous operation for High Volume Production. Charging of primary ingots, introduction of MONO-SHELL molds, melting and pouring, are carried out in vacuum through the ingenious use of charging locks.

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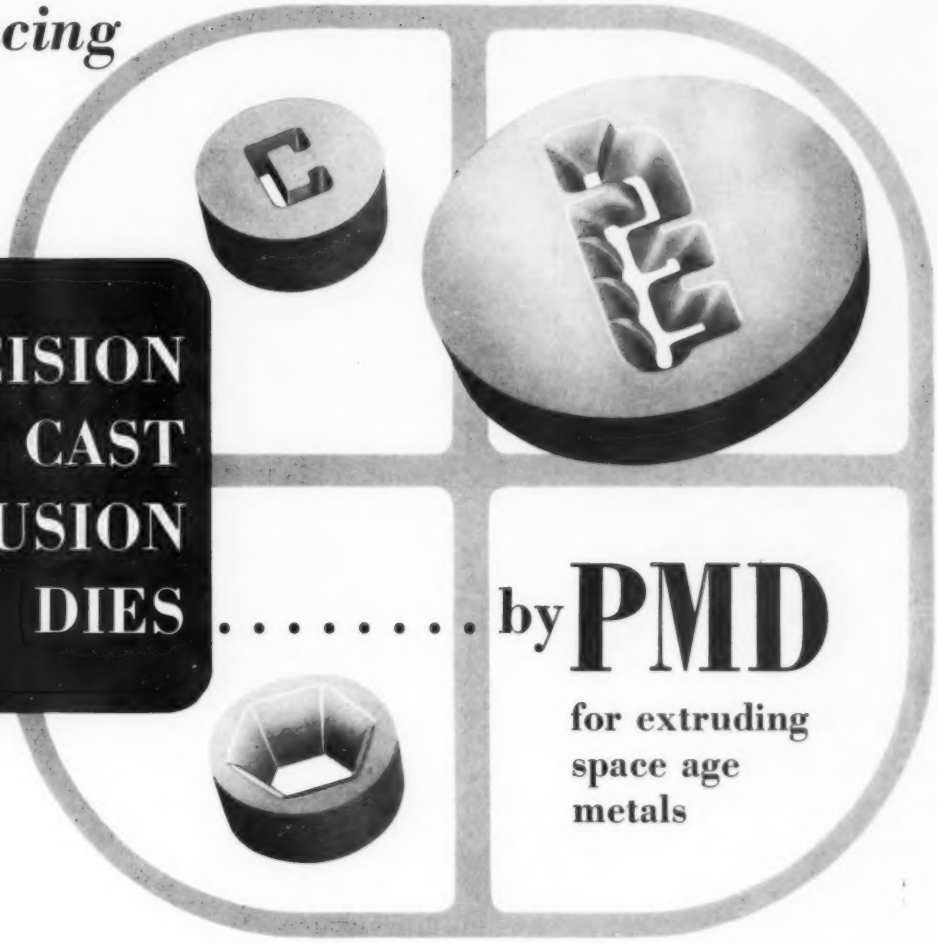

PRECISION CAST EXTRUSION DIES . . . . . by PMD

for extruding space age metals

NOW, in our own Shaw Process foundry, PMD is producing precision cast dies for extruding the new space-age metals such as titanium and A286 stainless steel, as well as copper base alloys and steel alloys.

These and other hard-to-work alloys can now be extruded at temperatures of up to 2,200°F with dies precision cast by PMD in alloys such as the chromium and tungsten hot-work steels, tungsten and molybdenum high-speed steels, and cobalt base alloys.

Extruders of these tough metals report closer tolerances, longer die life, superior die performance, and trouble-free operation with precision cast extrusion dies by PMD. These high temperature dies are designed and produced to the same high standards of craftsmanship that have made PMD the symbol of quality and dependability in aluminum extrusion dies.

PMD has the men, machines and experience to solve your difficult extrusion die problems.

PMD SERVICES FOR EXTRUDERS AND DIE CASTERS

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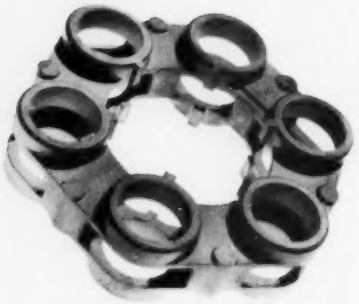

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because investment casting means easier, more consistent, more uniform parts with higher properties at lower cost.

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CASTING ABOUT

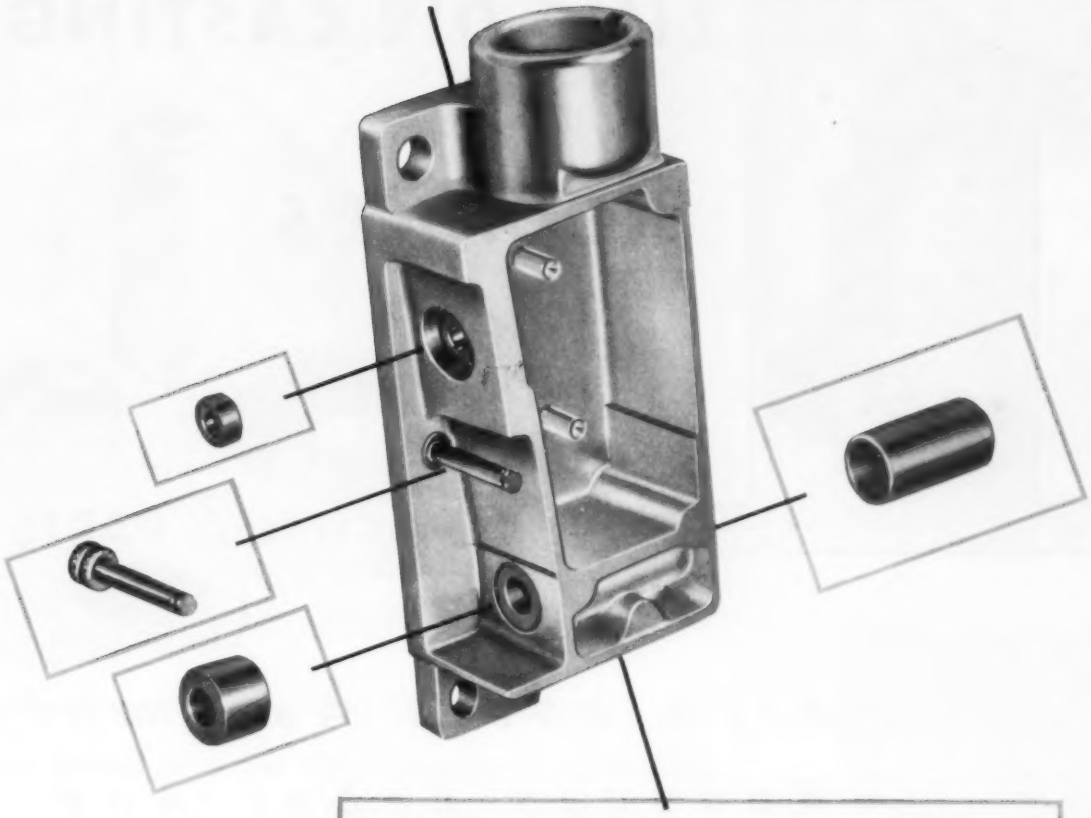
continued from page 8

PROSPECTS FOR THE ZINC INDUSTRY are bright according to a survey of market trends made by the American Zinc Institute. There is an upswing in consumption all along the line which is keeping the use of zinc in line with the general trend started in 1932. Since then the yearly uses of zinc have shown a steady gain. Slab zinc consumption in 1932 was about 250,000 tons and in 1956 had climbed to 1,100,000 tons. During these years there were, of course, minor reversals in consumption, but the overall trend has been steadily up.

THE EMPHASIS IN THE METALS FIELD during 1959 will continue to be on applications which require high strength, good ductility and resistance to both corrosion and erosion at very low temperatures (in the range of −346°F to −434°F) to handle liquid missile fuels and at very high temperatures, probably around 3000°F. There's good evidence that many of the pressing problems are near solution, at least in the laboratory. For example, a steel has been developed which, in the laboratory, has shown ultimate tensile strengths as high as 400,000 psi., the highest strength ever reached with metal. This steel is reported to have good ductility down to −385°F.

A NEW HIGH TEMPERATURE VACUUM FURNACE has been developed by General Electric Co. which can operate with high vacuum at temperatures up to about 2700°F. A feature of the furnace, a bell type, is the use of radiation shields instead of the conventional refractory insulation. With this type of construction the response of the furnace to temperature changes is very rapid. The outside bell is water cooled to maintain sufficient strength to withstand atmospheric pressure. A protective atmosphere can be used in the furnace, but convection losses are much higher than when the furnace operates at reduced pressure.

A COMBINATION OF HIGH TEMPERATURES, HIGH PRESSURES and almost explosive rates of reaction enable the economical single-stage reduction of oxides to metals. Hydrometals, Inc., formerly Illinois Zinc Co., has completed an agreement with Electro-Thermal Industries, Inc. for the process. Temperatures as high as 5000°F and pressures up to 500 tons per square inch are used. The reduction reaction, in a closed container, is triggered by an electrical discharge which sets off a so-called electro-thermal reaction. The process is said to be applicable to the direct reduction of such refractory metal oxides as columbium, tantalum, boron, tungsten, vanadium, zirconium, beryllium and others. It also allows the preparation of metal combinations that have previously been impossible to get through regular alloying methods.



"Hot-Shot Assembling"

with MADISON-KIPP zinc and aluminum die castings

"Hot-shot assembling" is a shop term but it is literal, because inserts are put in place and liquid metal under high pressure is shot into the die to surround and anchor the inserts in the die casting.

In many cases the advantages of cast-in inserts provide substantial cost savings even though the casting process is slower than when no inserts are involved.

The seasoned and skilled Madison-Kipp mechanics have had long experience in "hot-shot assembling." They may be able to assist you in your problems.

Please clip this ad as a reminder to contact us when you have die casting requirements.

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Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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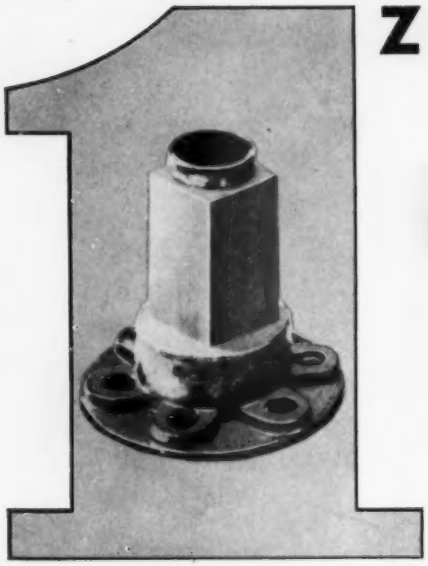
ZINC DIE CASTING



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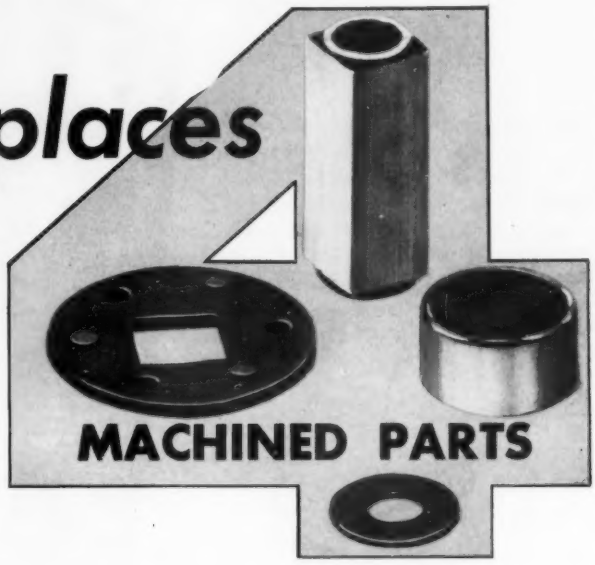

- *Eliminates Assembly*
- *Reduces Labor And Material Costs 50%*

This hub is part of the mechanism of coin-operated machines. Switching from brass and steel to a zinc die casting *slashed material and labor costs over 50%* for Chicago Coin Machine Division of Chicago Dynamic Industries.

Prior to the change, the 4-piece hub required 8 separate machining and assembly steps. The die casting however requires only 2; the casting is trimmed and the three assembly holes tapped. Scrap loss has been virtually eliminated, internal structural strength is fully retained.

The part is cast at a rate of 200 per hour in a 4-cavity mold and critical dimensions are held *as cast* to .005" overall, .003" concentricity. With annual hub requirements at 200,000, Chicago Coin Machine Division has found zinc die castings the way to meet today's rising production costs.

***DIE CASTING** is the Process*

***ZINC**, the metal*

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Lindberg-Designed

furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

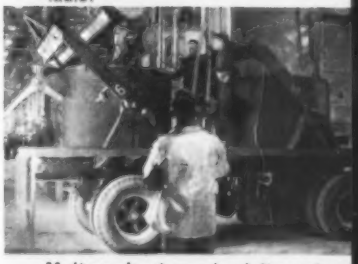
Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

SEE LINDBERG IN BOOTH No. 660 at the WESTERN METAL CONGRESS

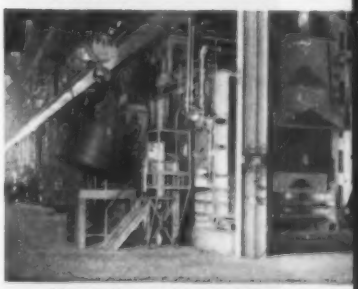
Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.

Some furnaces are arranged for hand ladling and others are equipped with Lindberg Autoladle.



Molten aluminum is delivered direct to reverberatory holding furnaces.



The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

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VALVE CASTINGS with intricate coring detail on all sides makes density control a prime requisite. H-P-M die casting machines are replacing other machines in this plant for such work.

Better die cast valve bodies

H-P-M Die Casting Machines "lock up tight" for consistent density control

HERE'S WHY . . .

- **Short Sturdy Frame**
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- **Extra Large Tie Rods**
- **Extra Heavy Platens**
- **No Links To Deflect**
- **Equal Overall Frame Stresses**
- **High Preloading Resists Die Parting**

Because of the outstanding features at the left, the H-P-M die casting machine produces cleaner, detailed castings with consistent density control for greater production per hour. There's less flash to trim, better dimensional control, better gate and venting control and overall better quality. As a result you get more shots per hour — longer die life — greater return for your investment.

H-P-M's link-wedge clamping mechanism prestresses the rugged frame and structural members, eliminates mold parting caused by deflection. This exclusive feature reduces flash and helps control density variation — saves metal, produces better surface finishes.

H-P-M die casting machines are heavier throughout — provide that margin of extra solidity and strength that assures better production and less scrap parts at top pressure conditions. Available in sizes from 200 to 800 ton. Send for completely illustrated bulletin today.

H-P-M DIE CASTING MACHINES have earned a reputation for more production, more profits at the fast growing W. L. Chapman Co., Pasadena, Cal. plant. Don't back away from the "tough ones" . . . put them on an H-P-M.

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BOOKS

METAL FATIGUE, Edited by G. Sines and J. L. Waisman; McGraw-Hill Book Co., New York, N. Y., 1959. Price: $12.50

In the past, literature on the subject of metal fatigue has been so widely scattered and so voluminous, that it was extremely difficult for the engineer to keep abreast of recently developed concepts and techniques. Recognizing this need for a wider dissemination of this knowledge, the editors of *Metal Fatigue* sought the leading authorities for each subject and have placed this key knowledge into print.

The major areas of interest are covered, and a great deal of the material is new. Included are recent advances in all aspects of the field. Sections in the book include: Fatigue Failure Mechanisms; Fatigue Testing; Analysis Of Influenting Factors; Load Analysis; and Structures and Machines.

MODERN FOUNDRY PRACTICE, Edited by E. D. Howard; Philosophical Library, New York, N. Y., 1959. Price: $15.00

Eighteen specialist authors combine to present all of the aspects of modern foundry practice. The discussions on ferrous metals, nonferrous alloys, heat treating, melting furnaces, etc. are very thorough, and are of value to the engineer as well as the layman. Other chapters deal with such subjects as: molding sands and dressings, molds and mold-making, eores and core-making, molding machines, modern molding developments, fettling practice, etc. It must be noted that in almost all cases the practices are British and the procedures would vary in America. Charts, tables, drawings & photographs are included.

POWDER METALLURGY IN NUCLEAR ENGINEERING, By Henry H. Hausner; American Society For Metals, Cleveland, Ohio, 1958. Price: $8.50

This book contains the eight papers presented at the Conference on Powder Metallurgy in Atomic Energy, held October 20,

continued on page 81

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PROTECTION The fire-resistance of CARBIDE's fire-resistant hydraulic fluids has been proved by severe, exhaustive laboratory tests. And, in actual service, water-base UCON hydrolubes have prevented serious fires and injuries during more than 10 years of routine use in all types of industrial hydraulic equipment. The common fire hazards connected with hydraulic operations are eliminated when UCON hydrolubes are used. UCON hydrolubes are classified as acceptable, less hazardous fluids by Factory Mutual Laboratories.

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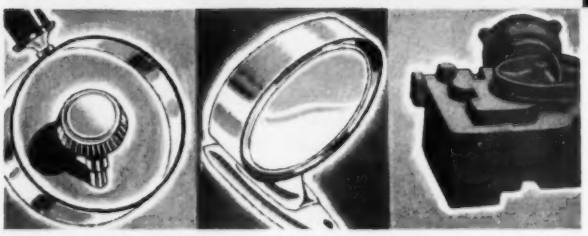
BIG

Automobile grilles

small simple complex



Watch stem winders Mirror frames Carburetors

whatever the die-casting job

specify TADANAC zinc

From the elaborate and massive grille of a modern car to the diminutive winder of a lady's watch, more and more die-castings are being made from that versatile metal — zinc. For the very best in die-casting zincs, specify TADANAC BRAND — or alloys made from it.

For information and assistance regarding zinc die-casting, contact our Technical Service Staff. Your inquiries will be given immediate attention.

With TADANAC BRAND Zinc you get electrolytically refined zinc of consistent high quality, low in impurities and always in good supply with prompt delivery assured.

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TADANAC ZINC SHAPES THE THINGS TO COME

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ACHESON

dispersions digest

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WHY 'DAG' DISPERSIONS MEAN *PERFORMANCE* IN ALUMINUM EXTRUDING

The excellent lubricating properties of Acheson Colloidal Graphite, under conditions of extreme heat and pressure have been confirmed by leading extruders of aluminum, steel, copper, brass, lead and other metals. Water-base dispersions of colloidal graphite used in the following application histories have provided savings in material handling, reduced maintenance time and expense, prevented seizure, extended die life, and produced extrusions of more uniformly high quality. Any one of these benefits should make profitable reading for you.

For faster, more uniform application with less material consumption, Aluminum Extrusions, Inc. finds 'Aquadag' their best die lubricant.

A little 'Aquadag' goes a long way for Aluminum Extrusions, Inc., Charlotte, Michigan. This company, one of the leading independent extruders in the country, has found that by applying 'Aquadag' on die surfaces they have effected a 30% savings in their material handling. Formerly, they had used an oil-graphite mixture which required a dilution ratio of 16 lbs. of graphite to a 55 gallon drum of oil. It was too slowly applied by swab and too coarse to apply by spray with any degree of efficiency.

With 'Aquadag', Aluminum Extrusions has a lubricant that is finer in particle size, permits wider coverage, and provides greater "sprayability". These minute particles pass freely through the spray nozzle, eliminating the costly downtime formerly involved in cleaning clogged equipment. The tough, dry film 'Aquadag' forms upon the evaporation of its water carrier, doesn't smoke or react when applied to hot dies and metals. This improves working conditions as well as extends die life. Important also to both die surfaces as well as the finished extrusion, is the fact that this durable, low-friction film allows easier, more uniform metal flow.

Considered in relation to the over 12 million pounds of aluminum extruded yearly at this plant . . . 85% of it in fabricated form . . . *'Aquadag' has brought important production efficiencies and material economy* to Aluminum Extrusions, Inc. In many, similar instances where product quality and basic economy are demanded, Acheson colloidal dispersions have gained ready acceptance.

Exclusive Acheson processing techniques guarantee a consistently uniform top-quality product. If your problem is more effective lubrication under normally adverse conditions of extreme temperature, pressures, or abrasion, call in your Acheson Service Engineer.

Extended die life and extrusions with more perfect surface finish, are attributed to the use of 'Aquadag'.

Dies last three times longer with 'Aquadag', according to another prominent midwest extruder. Metal pickup on the extruding dies has been completely eliminated by the use of this Acheson dispersion, extending the effective use of the dies from 1000 to 3000 strokes. The evaporation of its water-base leaves a dry, adherent "graphoid" film on all lubricated surfaces, inhibiting the build-up of abrasive precipitates. At the same time, the unbroken, microscopically-thin film that 'Aquadag' provides, facilitates metal flow and reduces scoring to a negligible minimum. Application of the lubricant is by spraying a dilution of 1 part 'Aquadag' to 20 parts water, on the die surface before each "push" of the extrusion press.

A 'dag' graphite coating is also applied to the follow blocks on this company's 1400 ton horizontal extrusion presses. For purposes of even greater economy, 'Prodag' — semi-colloidal graphite in water — is used in this application. This effective parting agent prevents the flash, back-extruded from the billet skin, from locking the butt to the follow block. An Acheson dispersion is very possibly the answer to your lubricating troubles. For additional information, write for your free copy of Bulletin 426. Address Dept. PMM-39.

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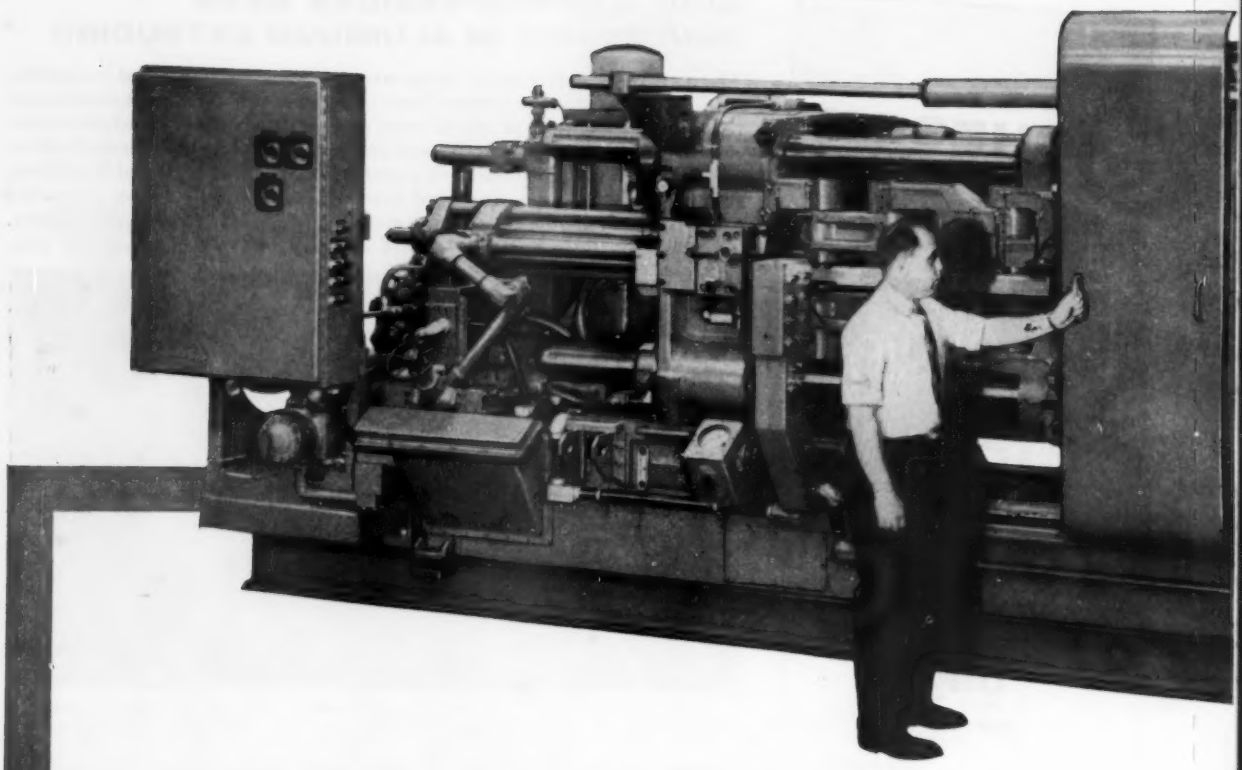
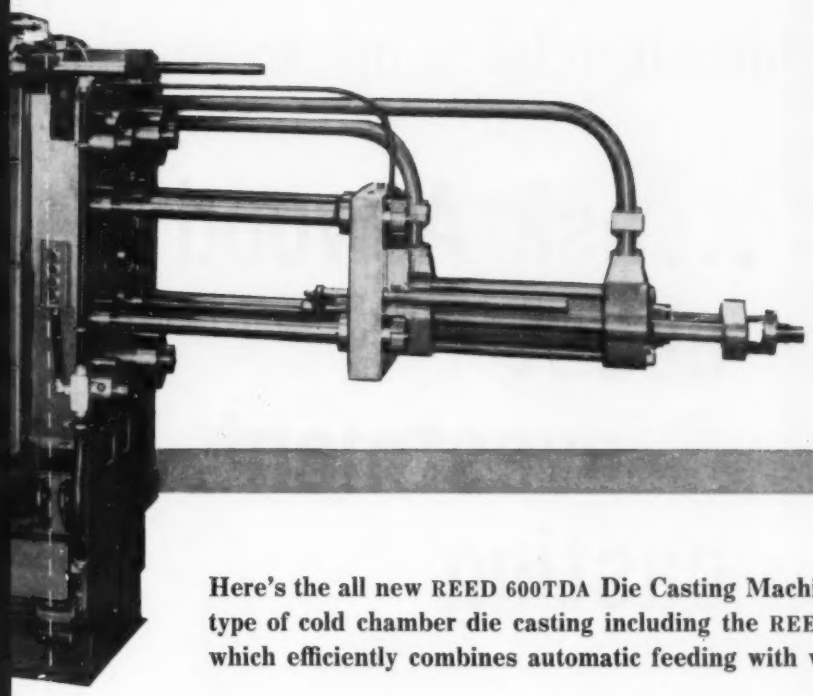


600 TON REED-PRENTICE DIE CASTER



Here's the all new REED 600TDA Die Casting Machine — designed for any type of cold chamber die casting including the REED VACUFEED system, which efficiently combines automatic feeding with vacuum die casting.

This newest REED hydraulic die casting machine has been designed to produce the highest quality aluminum and magnesium castings possible. The REED 600TDA has 47" x 46½" die plates; 28½" x 28½" clearance between tie bars; a tie bar diameter of 5½"; and a strain gauge tested locking pressure of 600 tons. Here are a few of the outstanding design and operating features of the 600TDA that give you more dependable, efficient operation.

- Die stroke adjustable over 6" of initial stroke, providing an adjustable stroke of 12½" to 18½".
- Complete shot stroke cylinder is adjustable from 14" to 20" in order to accommodate different length sleeves.
- Shot cylinder is equipped with an adjustable slow start to allow complete venting of sleeve and runner systems.
- Adjustment of tie bars is accomplished by the use of one retained graduated tie bar nut.
- Tie bars may be pulled or moved forward by hydraulic power using a cam way lock device.

REED 600TDA IS ESPECIALLY DESIGNED FOR VACUFEED OPERATION BECAUSE:

- Shot end of machine is free and clear for furnace installation directly under shot cylinder.
- Electric and hydraulic circuits provide for any type operation, with open electrical positions on terminal block for use in operating companion or automated equipment.

Ask your REED Sales Engineer today for complete details about the new 600TDA and the use of VACUFEED in your aluminum die casting operations.

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Is your new design complex?

...ask Arwood about investment casting

When you can't simplify the part any more without sacrificing function...

When the production people tell you it will be too costly to machine...

When you think you could cut production costs by making several parts as a single piece...

When function calls for a tricky shape but the intended service makes you specify, a hard, strong, tough-to-work alloy...

When any or all of these design problems are keeping you awake nights... then is the time to consider making the part an Arwood precision investment casting.

Here's why...

Investment casting by Arwood lets you stop worrying about *how to make* the part. You can design for function and end use... Arwood will give you the shape you need, in the quantities you need, from a few hundred to many thousands. Arwood casts all the ferrous and non-ferrous metals and alloys, from aluminum and magnesium right through to stainless steel and cobalt- and nickel-base superalloys.

Write today for your free copy of the new 44-page Arwood "Practical Guide to Investment Casting". It provides all the information you need to evaluate the technique and use it to help solve your design problems.

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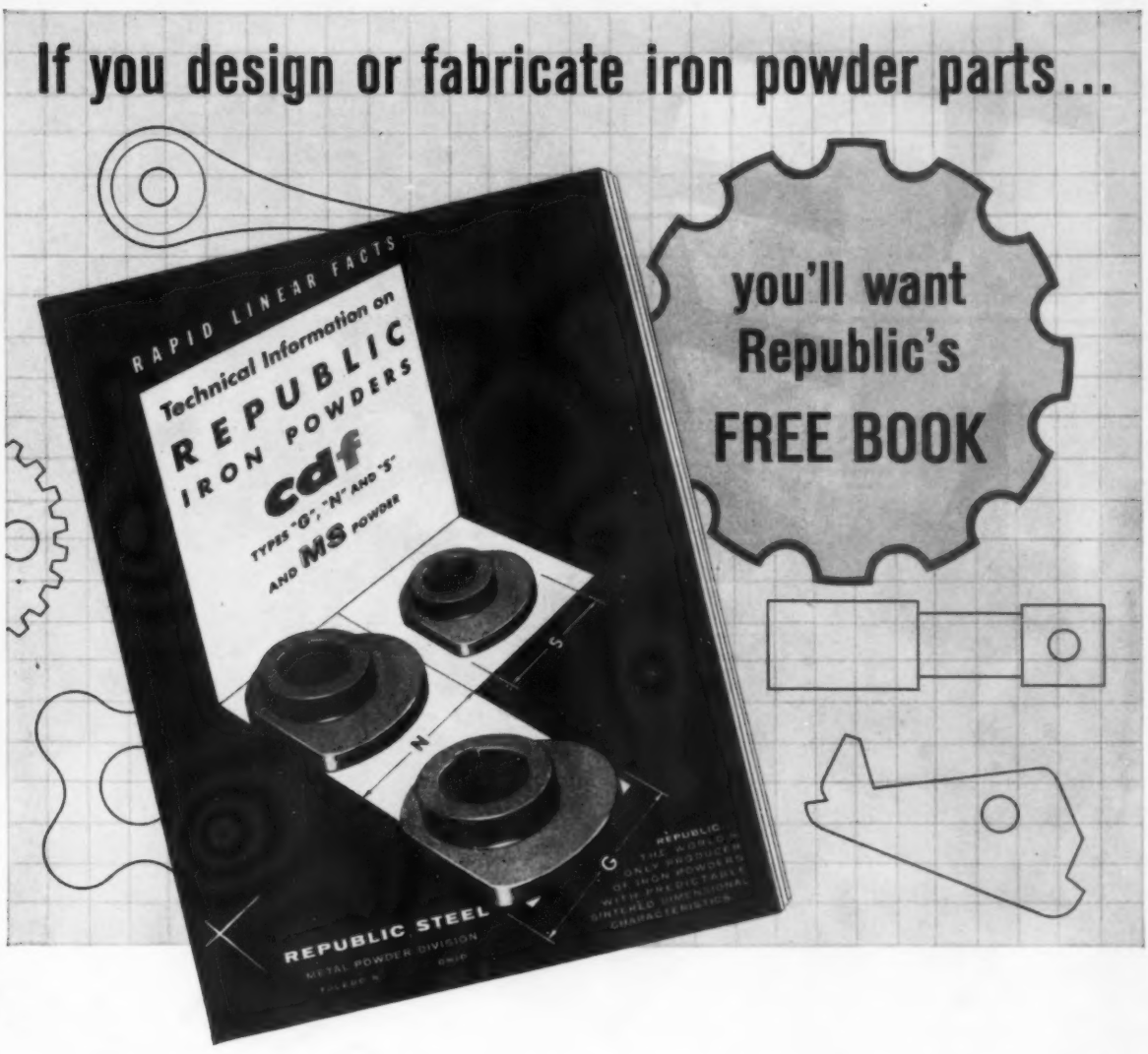
If you design or fabricate iron powder parts...



This new 48-page book has been prepared especially for tool engineers, part designers, metallurgists, and fabricators. It contains complete technical data on Republic's improved Controlled Dimensional Factor Powders and new MS Powder.

Data are presented by an entirely new method. Most of the necessary information regarding a particular powder's behavior can be read from the curves on a single set of ordinates.

The first section of the book lists complete specifications for Republic's CDF Powders, Type "G" for growth, Type "N" for normal, Type "S" for shrinkage. Each of these powders has been improved with regard to compressibility, dimensional characteristics, and increased tensile strengths.

Section two provides complete information on Republic's new MS Powder, developed principally for use with graphite rather than copper. MS possesses features which make it economically attractive for use in a wide variety of mechanical parts, and in electrical and magnetic applications.

Write Dept. PM-6865, 1441 Republic Building, Cleveland 1, Ohio, for your free copy of Republic's new Iron Powder Book. Ask for ADV. 1014.

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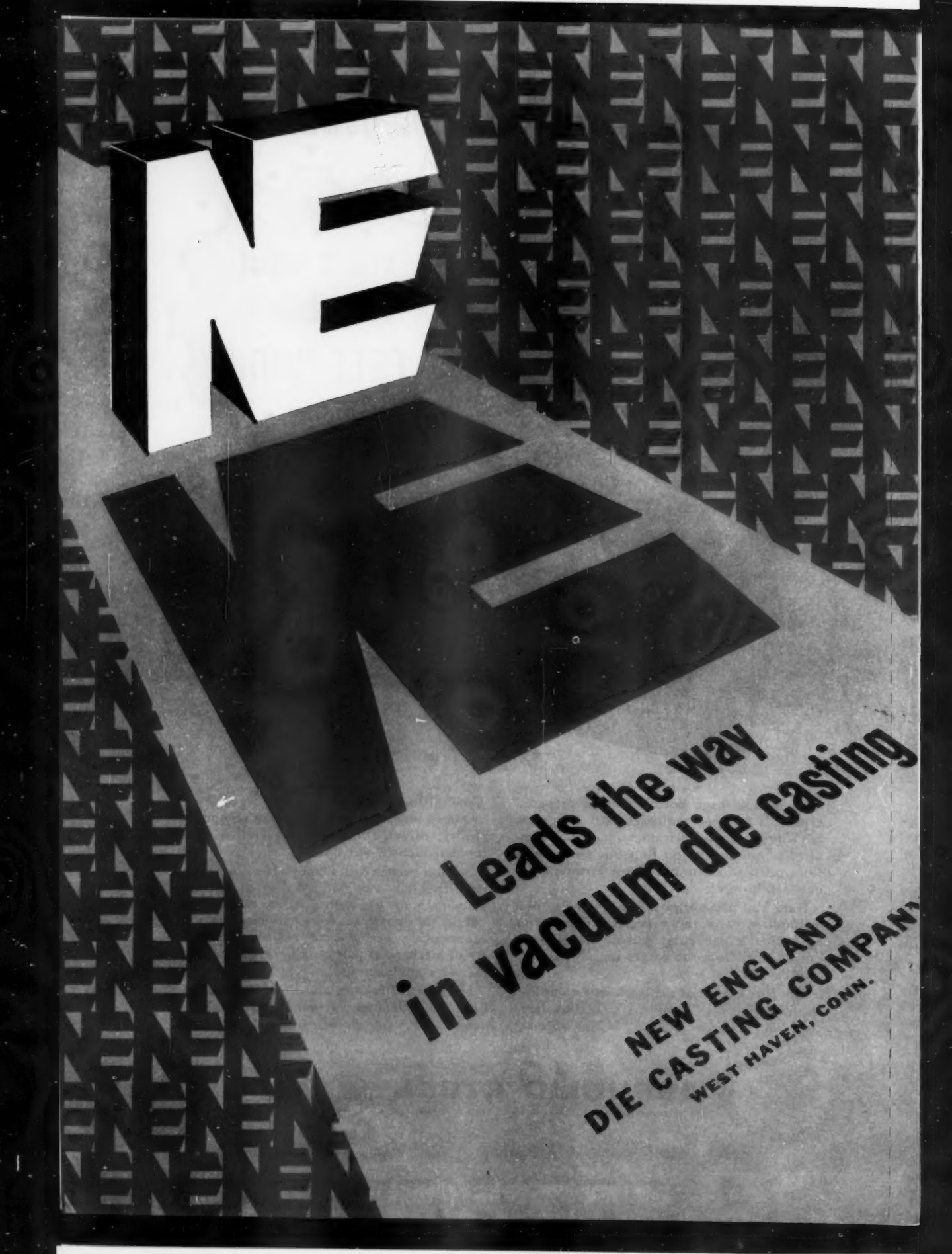
NE
VE
Leads the way
in vacuum die casting
NEW ENGLAND
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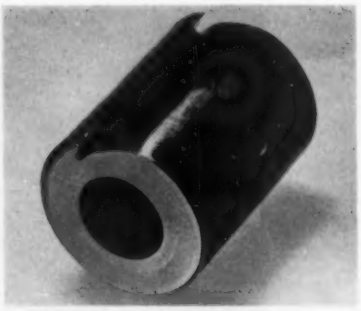
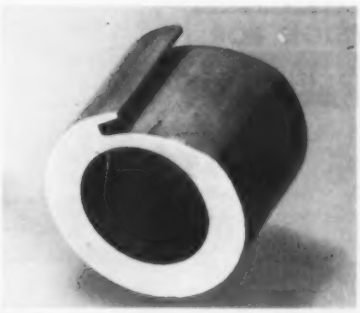
WEST HAVEN, CONN.

DESIGN FOR SINTERINGS



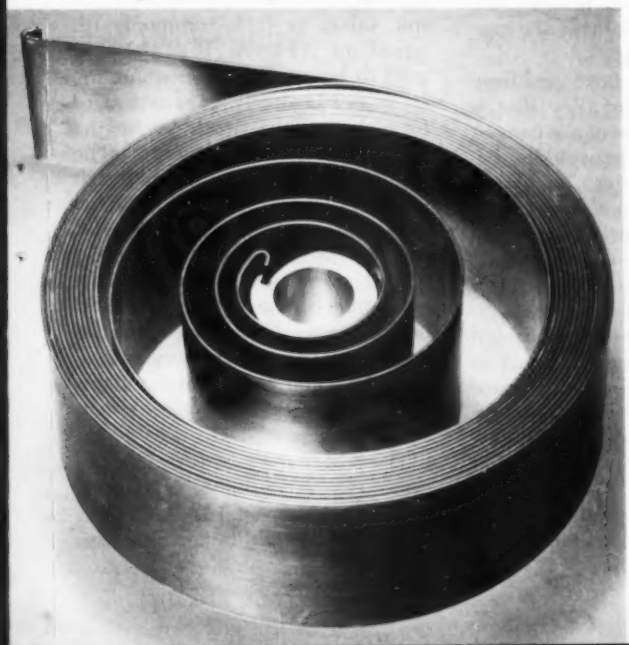


Here's the DIFFERENCE	OLD METHOD	SINTERING
	1. Drill and bore center hole for the shaft.	
	2. Face the end.	
	3. Cut to length.	
	4. Mill the slot and radius for the spring hook.	
	5. Drill a hole for the drive pin.	1. Drill hole for the drive pin.

Sinterings In High Stress Applications

CAN a sintered part withstand a torque of 675 pounds radial load? "Yes", says Mr. G. R. Pierce of the Aero-Motive Mfg. Co., "We use a sintered spring release hub in our Model 75-C Tool Balancing Reel. In everyday operation the hub withstands a torque of 525 pounds. Our tests show that this Model 75-C hub will withstand 675 pounds. That's why we will also use the hub in a new and heavier capacity reel that will be introduced soon."

A RELATIVELY THIN SECTION of the sintered hub has to take most of the stress when the spring is wound-up. Good design assures adequate strength for even excessive loads.



This spring hub is just one of many the company uses, in various sizes, in its complete reel line which includes Portable Tool Balancing Reels, Electric Cord & Cable Reels, and Static Discharge Reels. The Model 75-C Balancer is designed to suspend power tools in the 20 through 75 lb. class over assembly lines.

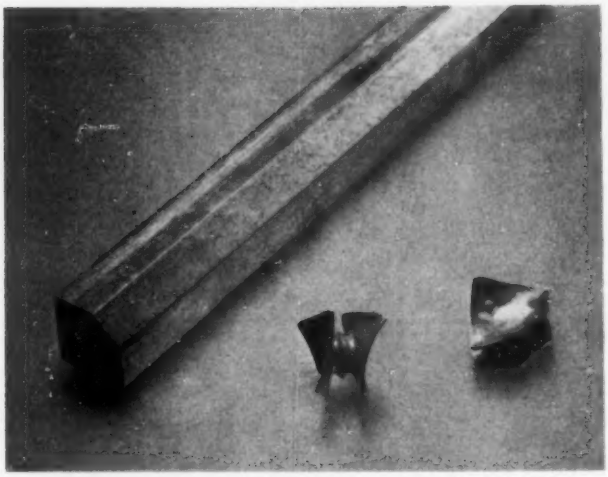
The hub is made by the U. S. Graphite Co. in steel and is heat treated to SAE specification #20.

In the asssembled reel, the hub is centered inside a 2" wide 75 lb. spring. (See figure 1) The hub is 1⅜" in diameter X 1" long with a ⅜" cored center hole. The hook on the spring engages in the slot of this hub. When the power tool is attached to the cable the spring is adjusted to balance the tool. If the cable should break or the spring be backwound the spring hook will disengage from the slot in the hub and rotate backwards preventing spring breakage. When rotated forwards the hook again engages and the torque is built up as the cable is drawn down.

The new heavy duty model, in which this same Model 75-C hub will be used, will have a considerably heavier spring. The hub will be withstanding a torque load of 675 pounds.

Originally, the hub was machined out of bar stock, a difficult and costly operation. The one thing that really pushed costs up was milling of the radius for *continued on page 44*

DESIGN FOR EXTRUSIONS



THE EXTRUDED BRACE looks just like the assembled part it replaced. The bar is extruded in the shape of the flanges. All that needs to be done is to machine the spindle and form the flanges to fit the curvature of the tubing on the trumpet.

Extrusions let you use . . .

One Piece In Place Of An Assembly

PRECISION, fine craftsmanship, reasonable price. These are the three standards that have to be met when student and professional musicians weigh one make of musical instrument against another. According to Mr. A. Freedman, of the York Band Instrument Co., "This is a highly competitive field. To meet, and beat the competition, we have to watch every step of manufacture. We use extrusions for the braces, water saddle key and valve guides, on our cornets and trumpets. Extrusions give us the precision and craftsmanship our reputation has been built on."

THE TUBE BRACE

The brace, Figure A. which supports the tubing on both sides of a trumpet's valves, is an extrusion. It doesn't even look like an extrusion in its final form. It looks just like the 3 piece assembly it replaced. This is just one of the advantages of the extruded brace, eye appeal. Although there is no great stress on these six braces, they have to withstand normal handling and use.

When it was made as an assembled part, the two flanges of the brace were stamped out of sheet brass. The flanges were then brazed to a spindle machined out of brass bar stock. After brazing, the flanges were shaped to fit the curvature of the tubing.

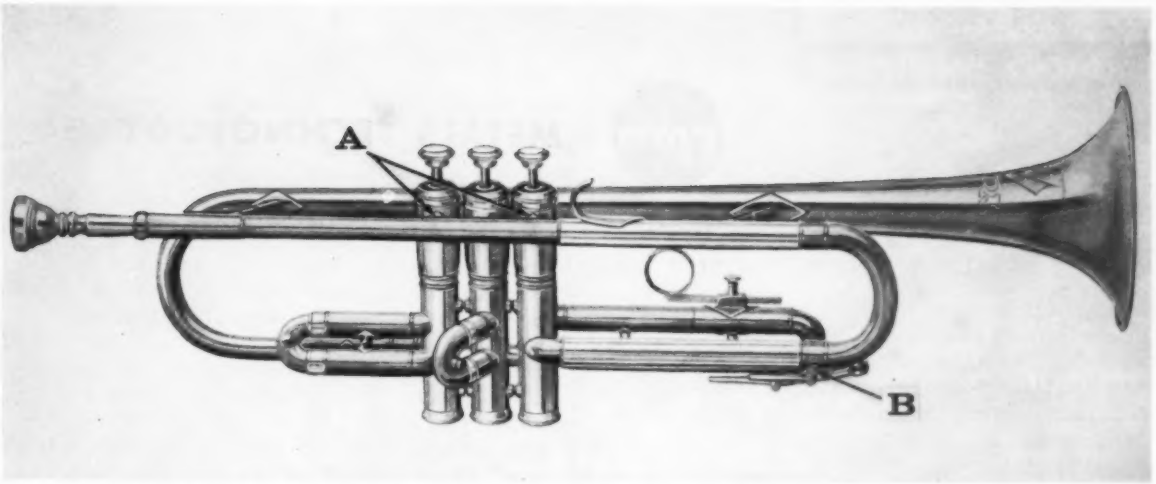
The brace is now fashioned from a bar of 70-30 brass alloy that is extruded in the shape of the flanges. First York forms the spindle between the two flanges. The brace is then cut off from the rod. The flanges of the brace are then formed to fit the curvature of the tubing. The brace is now complete, ready for assembly to the instrument.

The big savings of the extruded brace over the assembled part is labor. The spindle of the brace still has to be turned on a screw machine, but all brazing and assembly are eliminated. And, the tooling cost is low. The only cost is for the extrusion die. Costly punch press dies are eliminated. Mr. Freedman added, "Our reject rate is extremely low since we switched to extruded braces."

THE BRIDGE

The water saddle key, or bridge, supports the water valve lever, or spit valve, as it is commonly referred to. (Figure B.) The key used to be a progressive stamping. It was blanked, pierced and formed, then the two holes for the lever were drilled and tapped. The stamping had one advantage, it was inexpensive. But it had two disadvantages, it was weak and hard to assemble. So the company turned to extrusions for the key, even though the unit cost would be 200% more. Aluminum extrusions could not be used because saliva would corrode it. As with the brace, York uses 70-30 brass alloy extrusions.

The additional cost is mainly because the extrusion is a heavier part and more metal is used. But, it's worth the additional cost. Ex-



THE WATER SADDLE KEY, Figure B. and the brace, Figure A. are two of the extrusions used on this trumpet. Both of these extrusions add to the precision and craftsmanship that goes into the manufacture of this instrument.

trusions provided a better looking, stronger part, easier to assemble.

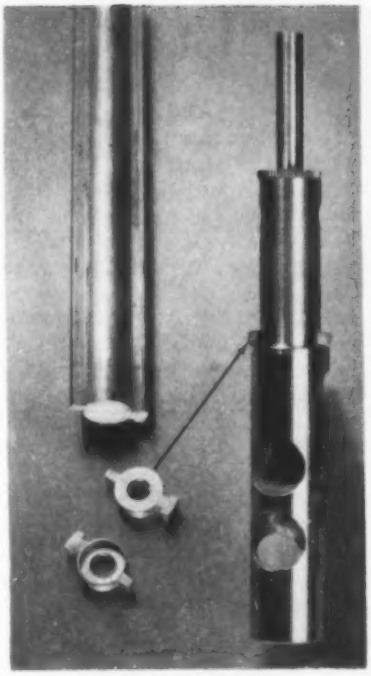
To use extrusions, it was necessary to redesign the key. The picture shows the extruded brace. The new design called for sharp points on the radius that fits over the tubing. (See picture) This is difficult to extrude. To get this shape, York machines the radius while the key is still in bar form. This done, the holes for the lever mechanism are drilled and tapped. The key is then ready for final assembly.

THE VALVE GUIDE

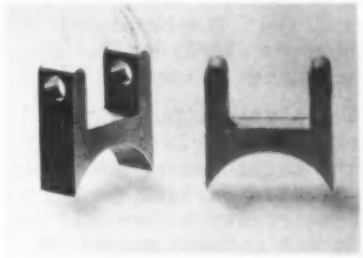
When a trumpet player presses a valve on his instrument, the effect is to lengthen the tubing he is tooting through. Pressing one or a combination of valves sets up the correct length of tubing for a given note. He must be assured that each time he depresses or releases a valve, no matter how fast, he will get the note he wants. When a valve is depressed, the holes in the valve, line up with the air ports in the tubing. The valve guide insures this action. The valve guide stays fixed and the valve is guided up and down over the guide by two slots in the upper part of the valve. Thus guided, the air holes in the valve will always line up with the air ports of the tubing.

This all-important guide used to be a stamping. It was first blanked and sized. Then it was necessary to handle each piece singly on a drill press to drill and countersink a hole for the valve spring to seat in. This handling and machining was expensive.

Now, the guide is fashioned from an extruded bar whose cross section is the exact shape of the guide. The two legs, which have to fit snugly into the valve's slots are extruded to ± 0.002. Now sizing and a costly sizing die are unnecessary. So is the hand finishing of the guide. There are no rough spots on the extrusion as there were on the stamped guide. The guide must be free from all roughness. The extrusion meets this requirement. All that needs to be done to the extruded bar is countersink and drill the hole for the valve spring to seat in, and then cut off. The guide then needs only a simple deburring operation to be ready for assembly.



THE EXTRUDED VALVE GUIDE replaced a stamping. The extrusion is more accurate and is free of surface roughness. Its location in the valve is shown by the arrow.



THE WATER SADDLE key costs more than the stamping it replaced. But the advantages far outweigh the additional cost. Note the sharp points on the radius that fits the curvature of the tubing .This was impossible to extrude. To get this shape it was necessary to machine the radius while the key is still in bar form.

PMM **METALS TECHNOLOGY**

DIECASTING ALLOY FOR COLOR ANODIZING

A recently-issued British Patent (798,341) describes an aluminum alloy for diecasting which can be anodized and dyed. In the past, the dyeing of anodized diecastings has not proved very satisfactory; components dyed in the brilliant or pastel colors used successfully with wrought metals tend to take the dye unevenly and a mottled or patchy finish results. For this reason, only black or very dark blue anodized coatings have proved commercially acceptable.

Mottling is characteristic of the silicon-containing alloys, but the patchy finish of diecastings in other alloys is generally attributed to the catching up in the turbulent metal stream of oxide films, and to the tearing of the nascent oxide film at the advancing edge of the stream as it moves across the cavity surface. These combined effects result in variations in the thickness of the oxide film at the moment of solidification. In consequence, the readiness with which the film takes up the dye varies from place to place, for the initial character of the surface film modifies its reaction to the anodizing operation. Where anodizing has been successfully carried out as a prelude to dyeing in earlier practice, it has usually proved necessary to cut down the as-cast skin on a wheel or belt in order to present a fresh surface for anodizing.

A great deal of development work in this field has been carried out by the proprietors of the patent cited above, John Ireland Limited of Bilston Street, Wolverhampton, England. It is claimed that the methods disclosed enable a consistently homogeneous anodized finish to be obtained from a relatively inexpensive diecasting alloy, and that the resulting anodized layer accepts evenly a wide range of brilliant or pastel colors.

Two distinct factors are involved; the use of an appropriate alloy specification and the maintenance, under strict control, of specific casting techniques. The basic specification covers alloys with from 1.0 to 3.5 percent magnesium, 0.5 to 1.5 percent manganese and small additions of beryllium, together with a proportion of one or more of the alkali earth metals barium, calcium and strontium. It is stated that the manganese serves to increase strength and improve corrosion resistance, while the alkali earth metals refine the grain structure and help to produce a high quality as-cast finish. The function of the beryllium is to stabilize the magnesium compounds, which otherwise tend to separate and so give rise to deleterious oxides. Beryllium is also said to reduce occluded gases in the melt.

Within the basic specification there is scope for considerable variation of composition, but the patentees cite as typical the percent composition of Table I.

The casting techniques adopted, while not differing radically from those customary in the industry, demand a very strict control of melting methods and casting variables. Ingot metal is melted direct in the holding furnace at the machine, and it is important during this operation to avoid carrying parts of the surface film down into the melt. While the metal is being brought up to casting temperature it is fluxed from time to time. The standard commercial fluxes for Al-Mg alloys may be employed. It is stated that the optimum pouring temperature is somewhat higher than for the standard Al-Si alloys.

The results obtained also depend in part upon correct die design, and it is necessary to provide generous overflow-wells and runner channels in order that as little oxide film as possible shall be ingested in the metal stream and that any which is carried into the cavity shall be swept out into the overflows. The form of the runners must be such as to avoid turbulence in the stream or "soldering" where the jet impinges upon the cavity face.

TABLE I: DIE CASTING ALLOY FOR COLOR ANODIZING

Designation	Composition								
	Mg	Mn	Fe	Zn	Si	Ni	Ca	Be	Al
Brit. Pat. 798,341	1.4	0.75	0.15	0.10	0.2	Tr.	0.20	0.02	Bal.

Miniature Investment Castings

THE accent today is on miniaturization. One of the early users were the folks who make hearing-aids. Today there are few industries that use metal components who do not, or can not, use investment castings. These may or may not be miniature parts, but it's a good bet that if any manufacturer uses tiny parts which must be machined, he has a probable application for miniature investment castings.

About 12 years ago, Precision Metalsmiths, Inc. started making these little castings. Some of them so tiny that hundreds will fit into a teaspoon; others quite large, about twice the size of a penny. The castings go into almost every industry group which fabricates or assembles metal products.

WHAT METALS CAN BE CAST?

Any castable metal can be used to make these little parts. The size has no effect. Foundry methods may have to be modified, but this doesn't affect the buyer. In the parts shown on the following pages are examples of parts cast in aluminum, stainless steel (both the 300 and 400 series), beryllium copper, silicon brass, Stellite, beryllium nickel, tool steel, alloy steels (4300 series, 4620, 52100 are examples), and low carbon steel (1020).

WHAT IS A MINIMUM RUN?

If a properly designed pattern in a disposable plastic is furnished a single prototype casting can be made. When machined steel wax or plastic injection dies need to be made it is generally desirable to have a run of about 1000 pieces. This is dependent on economics and in some cases it has been cheaper to cast as few as 20 parts rather than fabricate them.

WHAT TOLERANCES CAN BE HELD?

Dimensions within any ½" on a casting can be held, consistently, to ±0.003; within any 1" tolerances of ±0.005 are normal.

continued on next page

On weight, the smallest industrial casting made so far weighs only 0.05 grams. This is not the minimum that can be cast, just the smallest up to now.

The minimum wall thickness that has been cast, so far, is 0.015". To get such thin walled castings requires a highly fluid alloy and may be limited to such materials as aluminum alloys and beryllium copper.

Holes have been cored which are only 0.030" in diameter. This is probably at or near the minimum since the cores are extremely fragile and difficult to cast around.

Surface finish, as cast, depends on the alloy. For aluminum a surface of 65 micro inches RMS can be regularly secured. Under special conditions even smoother surfaces can be furnished. Most steels give a rougher surface, in the order of 125 micro inches, RMS. Copper base alloys will fall between aluminum and steel depending on the particular alloy cast.

CUSTOMER ACCEPTANCE

Standard foundry practice is to inspect a random 10% sample. Experience has shown that under this sampling plan customer rejects are almost nil. When required by purchasing specifications, any greater sample will be inspected, up to 100%. Greater inspection will, of course, increase the part costs.

The usual procedure is to make up sample castings for customer approval. A lot of 25 castings is made from it. At least 6 parts are taken for complete inspection. If these pieces pass, the part is released for production.

COSTS

In many of the parts illustrated there is no previous manufacturing history for cost comparison; the parts were designed originally as investment castings.

Where there is manufacturing history, investment casting has shown a cost saving of at least 10% and in many cases 90% or more.

WHAT INDUSTRIES USE MINIATURE INVESTMENT CASTINGS?

ORDNANCE AND ACCESSORIES

This industrial group formerly accounted for about 80% of the entire output of the investment casting industry. Largely through industrial efforts to diversify, it now represents a very much lower percentage of the total output.

The experience gained in the manufacture of turbine blading for aircraft will probably stand the industry in good stead when the gas turbine becomes more widely used as a prime mover in place of the internal combustion engine.

FABRICATED METAL PRODUCTS

This is probably the largest industrial manufacturing group of any served by the investment casting industry. Some of the earliest non-military uses of investment castings were in this group of manufactured products. Machine tools, hand tools, etc are included. Castings for this industry are made in beryllium copper, silicon brass, bronzes, stainless steels (mostly in the 300 series) and various tool steels.

ELECTRICAL MACHINERY

This segment represents one of the best customers of the industry. Most of the castings shown above are in either beryllium copper or silicon brass.

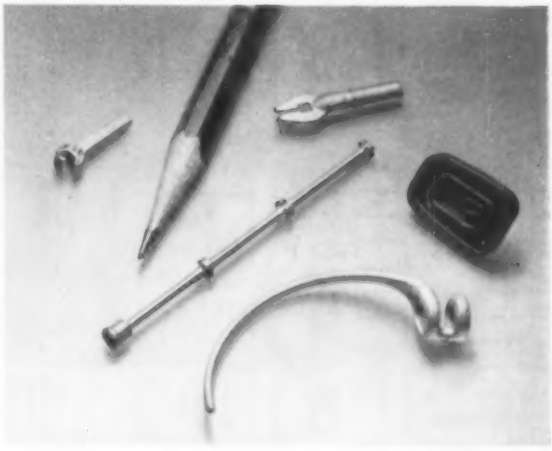
MISC. MANUFACTURING INDUSTRIES

Another industry group which uses castings in almost every castable metal. Both ferrous and non-ferrous metals are represented.

NON ELECTRICAL MACHINERY

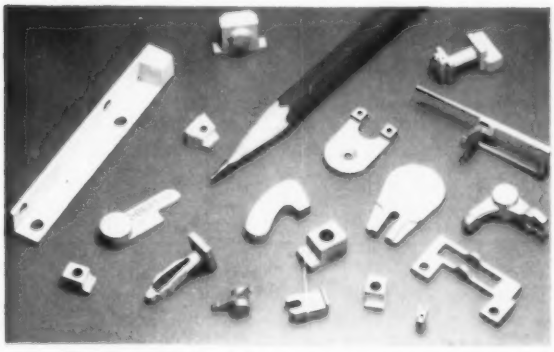
This industry group uses castings in almost every castable metal. Shown are parts in beryllium copper, beryllium nickel, stainless steel of the 300 series, SAE 1020, and alloy steels of the 4300 series and also 4620.

SCIENTIFIC AND OPTICAL GOODS



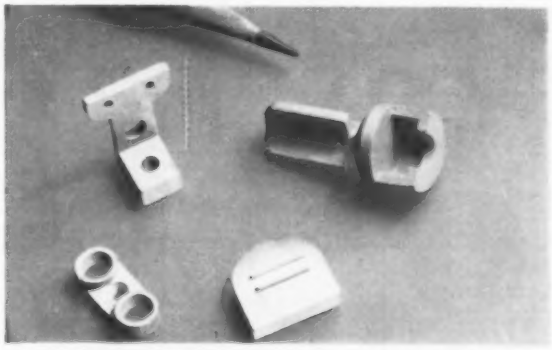
These castings include some of the most precise and complicated ones made. All metals and alloys are represented at some time.

FURNITURE AND FIXTURES



In this group are castings in 303 stainless steel, 440F stainless steel and alloy steels of the 52100 types.

TRANSPORTATION



Penetration into the transportation industry is still rather slight. With the automobile industry as a major factor, good applications are wanting.

PMM **TECHNICAL REFERENCE FILE**

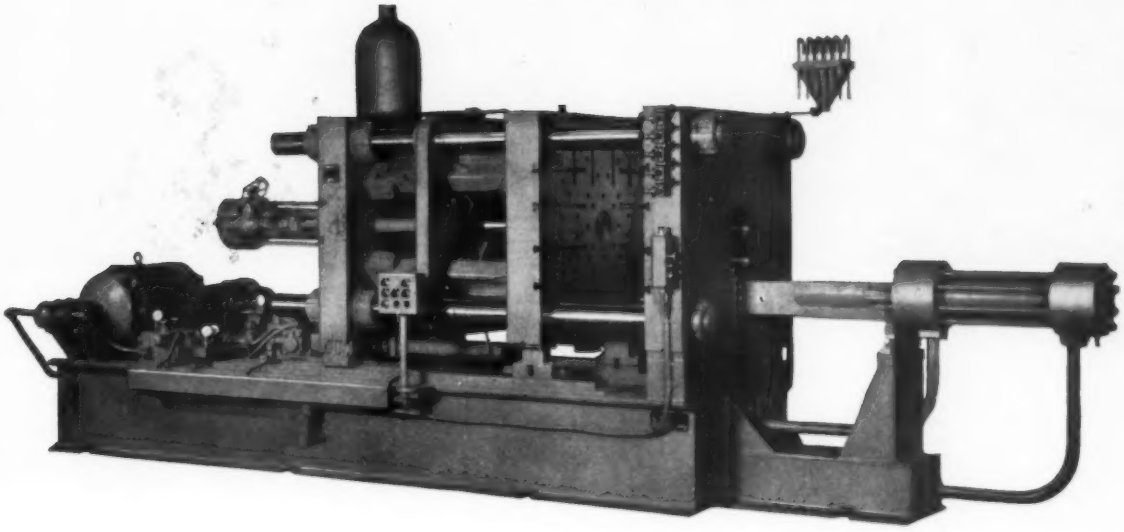
PROPERTIES OF EXTRUDED ALLOYS — TABLE VII

Comparative Properties of Extrudable Copper-base Alloys

Alloy Name	Copper	Free-Cutting Copper	Leaded Commercial Bronze	Medium Leaded Brass	Special Low-Leaded Brass	Riveting and Turning Rod	Free-Cutting Brass	Forging Brass	Muntz Metal	Leaded Naval Brass	Naval Brass	Free-Cutting Naval Brass	Manganese Bronze	Architectural Bronze Heavy-Leaded	Architectural Bronze	Arsenical Bronze	13% Nickel Silver	10% Nickel Silver
Nominal Composition, percent — Copper	99.90 min.	99.4	89	64.5	63	62	61.5	60.0	60.0	60	60	60	58.5	57	56.5	56.5	43	46.25
Zinc	—	—	9.25	35	36.25	36.25	35.5	38.0	40.0	38.5	39.25	37.5	39.2	40	41.25	39	44	43.75
Lead	—	Te 0.6, P 0.007 max.	1.75	0.5	0.75	1.75	3.0	2.0	—	0.75	—	1.75	—	3	2.25	0.75	—	—
Other										Sn 0.75	Sn 0.75	Sn 0.75	Fe 1.0, Sn 1.0 Mn 0.3			Ni 2.0, As 0.6 Mn 0.2, Fe 1.0	Ni 13.0	Ni 10.0
General Properties	High electrical conductivity, high thermal conductivity, excellent working ability.	Similar to copper but with free-cutting properties.	Good bending properties for simple shapes such as drawer handles.	Good bending and forming properties but restricted to simple shapes—good machinability	Same as medium-leaded brass but with slightly better machinability.	Best compromise between machining & moderate cold-forming properties	Excellent machinability combined with good mechanical and corrosion resistance properties.	Extremely plastic hot—combining good corrosion resistance with excellent mechanical properties.	Inexpensive combination of good strength and moderate ductility.	Resistant to salt water corrosion with added machinability.	Resistant to salt water corrosion, satisfactory for moderate cold-working operations.	Similar to free cutting brass but with increased strength and corrosion resistance.	High strength combined with excellent wear resistance.	Excellent free machining and forging properties.	Excellent forging and machining properties.	Excellent forging properties.	Silvery white color.	Silvery white color.
Working Properties — Machining	Poor	Excellent	Good *	Good *	Good *	Good *	Excellent *	Good *	Good Gas, carbon arc, metal arc	Good *	Good Gas, carbon arc, metal arc	Excellent *	Good Gas, carbon arc, metal arc	Excellent Poor	Good Poor	Good *	Good Fair	Good Fair
Welding	Deoxidized Type Preferred	Not recommended																
Soldering	Excellent	Good	Excellent	Excellent	Excellent	Excellent	Good	Good	Excellent	Good	Excellent	Good	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Polishing	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Density, lb/cu in.	0.322	0.323	0.319	0.306	0.306	0.306	0.307	0.305	0.303	0.305	0.304	0.305	0.302	0.306	0.305	0.302	0.315	0.315
Young's Modulus X10°	17	17	17	15	15	15	14	15	15	15	15	15	15	14	14	16	17	
Melting Point, deg F	1,981	1,981	1,900	1,700	1,660	1,650	1,650	1,640	1,660	1,635	1 650	1,650	1,630	1,630	1,623	1,630	—	—
Avg. Coefficient of Thermal Expansion per deg F (68 to 570 F)	0.0000098	0.0000098	0.0000112	0.0000113	0.0000114	0.0000114	0,0000114	0.0000115	0.0000116	0.0000118	0.0000118	0.0000118	0.0000118	0.0000116	0.0000116	0.0000118	—	—
Electrical Conductivity % IACS at 68 F	101 (annealed)	90 min.	42 (annealed)	26	27	28	26	27	28	26	26	26	24	28	28	—	—	—
Thermal Conductivity Btu/sq ft ft/hr F at 68 F	226	205	104	67	69	73	67	69	71	68	67	67	61	71	71	—	—	—
Tensile Strength, psi	32,000	32,000	37,000	48,000	46,000	50,000	49,000	52,000	54,000	57,000	57,000	57,000	65,000	60,000	60,000	65,000	85,000	81,000
Elongation, % in 2 in.	55	40	45	60	55	58	53	45	50	42	47	40	33	30	30	40	20	22
Yield Strength, 0.5% ext., psi	10,000	10,000	12,000	12,000	14,000	15,000	18,000	20,000	21,000	19,000	25,000	25,000	30,000	20,000	20,000	22,000	50,000	45,000
Rockwell Hardness	40 F	40 F	55 F	56 F	69 F	67 F	68 F	78 F	80 F	82 F	55 B	55 B	65 B	65 B	65 B	85 B	83 B	75 B
ASTM Specifications	B124		B140					B124	B124		B21, B124	B21	B124, B138					

*Non-leaded alloys preferred for welding.

GREENLEE BROS. & CO. has purchased the well-known B&T MACHINERY COMPANY and entered the die casting machine field



PRODUCTION MACHINERY
GREENLEE

The B & T Machinery Company, well-known manufacturer of die casting machines for zinc and aluminum, is now a division of Greenlee Bros. & Co., Rockford, Illinois.

The strength of Greenlee production facilities, Greenlee cooperative engineering and Greenlee sales and service engineers, is now combined with the personnel and facilities of the B & T Machinery Company.

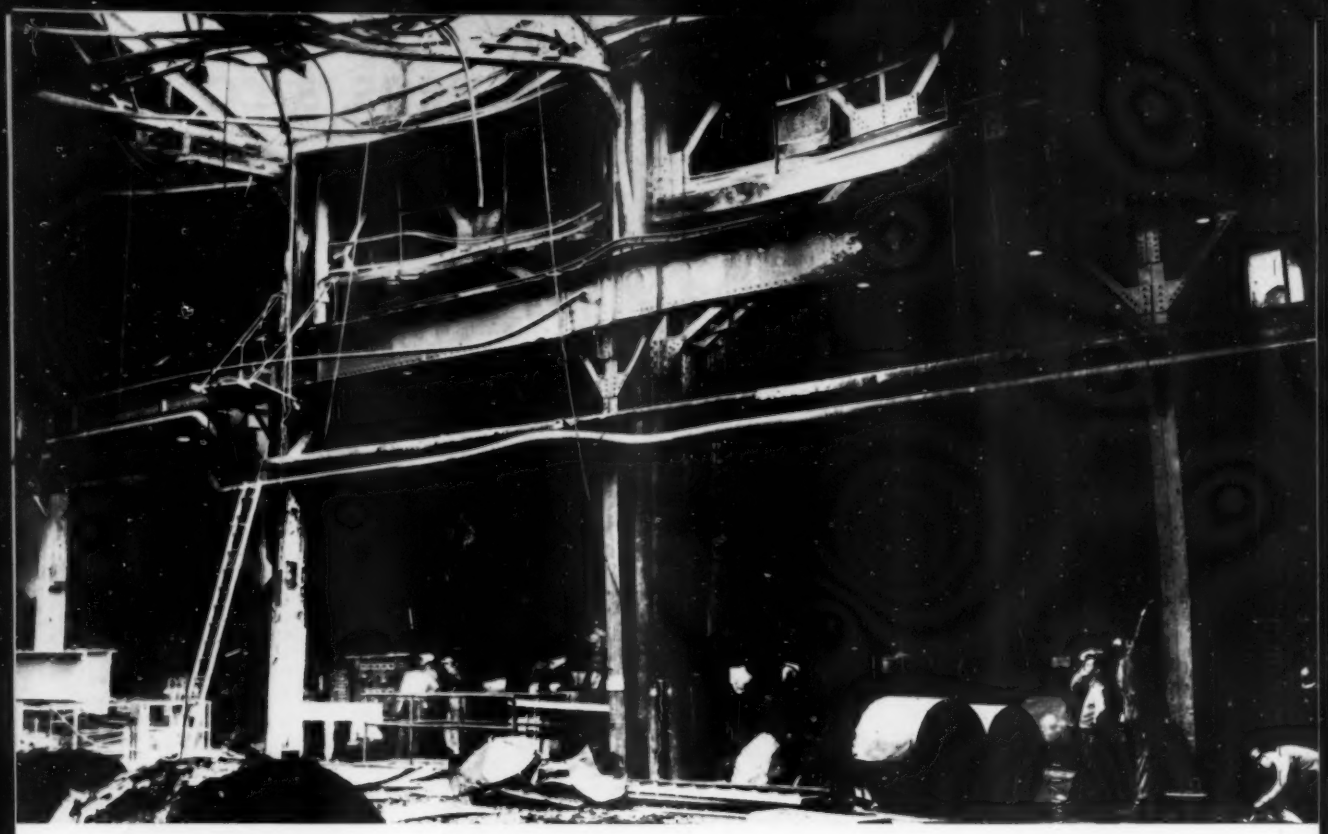
B & T die casting machines and hydraulic trim presses will be sold and serviced through the Holland, Michigan plant with the assistance of the national Greenlee sales organization.

B&T MACHINERY COMPANY

A DIVISION OF GREENLEE BROS. & CO., ROCKFORD, ILLINOIS

217 WEST EIGHTH ST., HOLLAND, MICHIGAN • PHONE EXport 2-2341

For more information circle No. 11 on the Reader Service Card



WEIRTON, WEST VIRGINIA **$925,000 LOSS**

The Case For

NO matter how good your housekeeping, how careful your inspection or how meticulous your maintenance, hydraulic line failures never give any warning.

When the lines break you can have a disastrous fire, unless you're using fire resistant hydraulic fluid.

Even if the physical loss to buildings and to equipment is covered by insurance, even if you carry business interruption insurance a fire can either put you out of business or so cripple you that an entirely new start with new customers will have to be made.

But even these reasons are not the most important. Remember that you are dealing with the lives of your employees. A fire, especially one where burning oil is spraying around a building, can mean death or serious injury to personnel. It's a risk that an employer dare not take.

Here are a few case histories of what happened when lines carrying flammable hydraulic fluid broke. Material from National Fire Protective Association.

Sept. 19. 1946 Grand Rapids, Mich. $43,025 loss

Breakage of an hydraulic cylinder head on a press allowed 70 gallons of oil under high pressure to be sprayed into molten zinc. Rapid ignition of the oil blew out all windows of the 1-story, 8000 sq. ft. wood building, flames engulfed the structure. Four employees severely burned.

Oct. 27, 1950 Battle Creek, Mich. $750,000 loss

Rupture of a rubber hose carrying hydraulic fluid at 400 psi allowed oil to spray on hot furnace. 30,000 sq. ft. of a 45,000 sq. ft. building were damaged.

June 29, 1948 Chicago, Ill. $40,000 loss

Workmen installing a new die on a die casting machine broke an elbow on a ¾" pipe carrying oil under 500 psi pressure. Oil squirted to the underside of the monitor roof, wood-joisted building and was ignited by a gas burner on a melting pot of an adjacent machine.

March 28, 1950 Pueblo, Colo. $450,000 loss

Flammable hydraulic fluid released from a broken ⅜" tube fitting on a molding machine in an aluminum

BATTLE CREEK, MICHIGAN **$750,000 LOSS**

Fire Resistant Hydraulic Fluids

foundry. The oil sprayed onto an electrically heated aluminum holding pot and ignited. The fluid, under 300 psi pressure and supplied by a 65 gallon tank continued to spray the ceiling and most of the interior of the 30,000 sq. ft. wooden building.

Feb. 27, 1952 Miamisburg, Ohio $86,748 loss
Oil at 1000 psi pressure released from an hydraulic oil line to a die casting machine sprayed over a wide area and ignited at a pot of molten metal. Fire burned out the die casting and finishing rooms before being controlled.

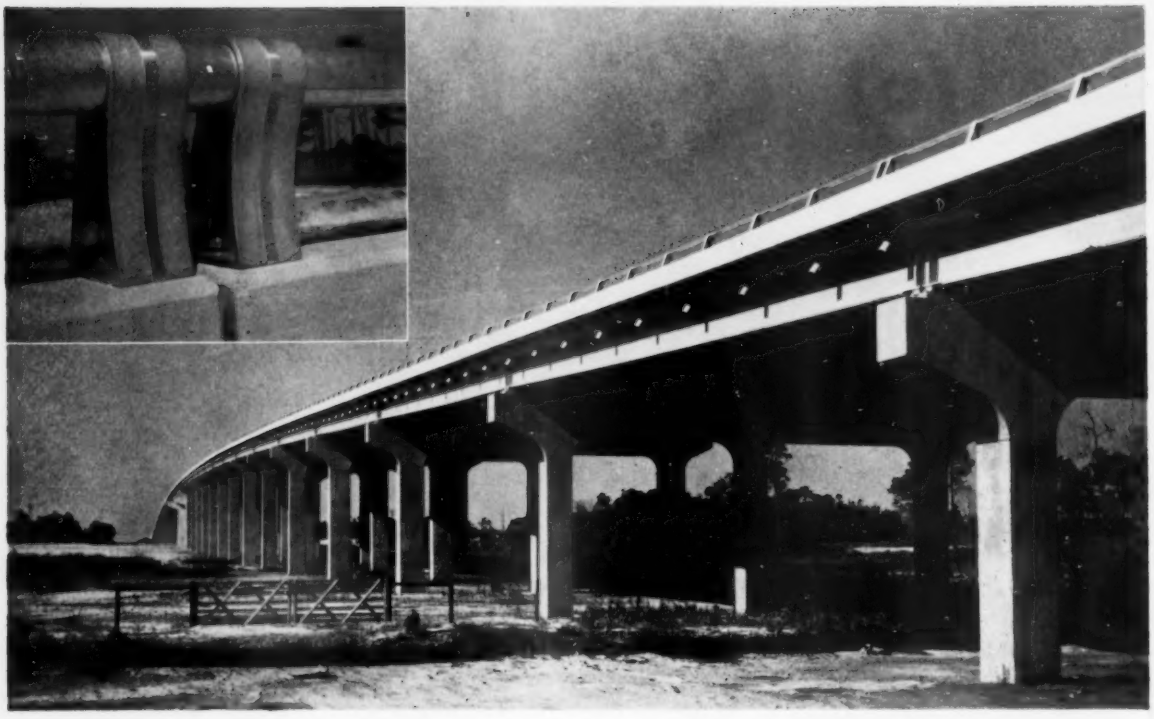
March 21, 1952 Los Angeles, Cal. $6,100 loss
Rupture of a check valve on the end of a shot cylinder of a die casting machine allowed oil under high pressure (about 1800 psi) to escape and splash on the heated furnace at the machine. Three employees were burned by the hot oil.

May 2, 1950 Weirton, W. Va. $925,000 loss
Hydraulic fluid line carrying oil at 750 psi broke. Burning oil ignited asphalt coated metal roof damaging about 250,000 sq. ft. of the roof. Drops of burning asphalt caused extensive damage to contents of plant and prevented firefighters from reaching the base of the fire.

March 7, 1953 Cudahy, Wis. $100,000 loss
Mineral oil at high pressure released as a fine spray from an hydraulic valve on a forging press. Oil ignited by adjacent furnace. Asphalt coated metal roof (43 ft. to 60 ft. above floor) ignited. 90% of the roof destroyed, little floor damage. Three employees killed.

Jan. 4, 1950 Hamtramck, Mich. $60,000 loss
The ¾" high pressure hydraulic oil line burst allowing oil to escape and be ignited by a salamander nearby. The entire 1-story brick, wood-joisted building was in flames in a matter of seconds.

July 14, 1948 Milwaukee, Wis. $200 loss
Flammable hylraulic oil was released under high pressure and was ignited by an electric arc. Fire confined to the machine by a metal ventilating hood.



PERMANENT MOLD CASTINGS

Cast and extruded aluminum are doing their share for . . .

The New Look On Bridges

When aluminum replaces cast iron and steel in bridge railings, everyone gains except the painter – he's lost some work.

For the engineer who designs the bridge it means less dead load to support.

For the contractor it means faster installation.

For the construction worker it means lighter pieces to handle.

For the people who pay for the bridge it means a lower cost.

For the maintenance people it means less work, lower costs.

For the motoring public it means safety.

Most of these advantages are obvious. They come about mostly because a piece of aluminum weighs only a third of its steel counterpart. The rest of the advantages, except safety, come from aluminum's remarkable corrosion resistance. It shows this resistance in almost all atmospheric conditions in which you'd be apt to use castable and extrudable aluminum alloys. This is what hurts the painter.

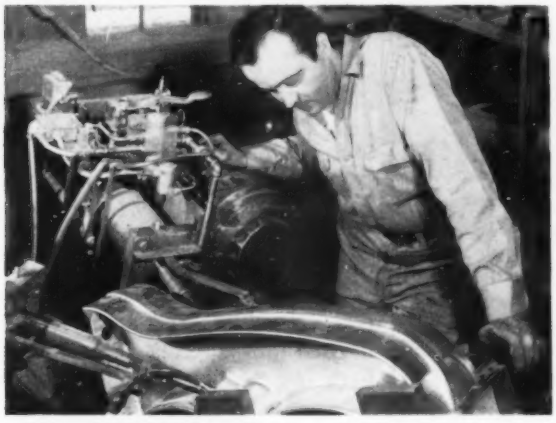
But the increased safety for the motoring public tells another and most important story. Let's suppose that an automobile traveling at fairly high speed hits the railing. Now if the railing and posts are cast iron, the impact load will be absorbed up to the yield point of the metal. Above that, the posts will break and the car will take off into space.

And even if the railing holds, most of the impact will be absorbed, by reaction, by the automobile and the occupants. The result, a lot of people dead or hurt.

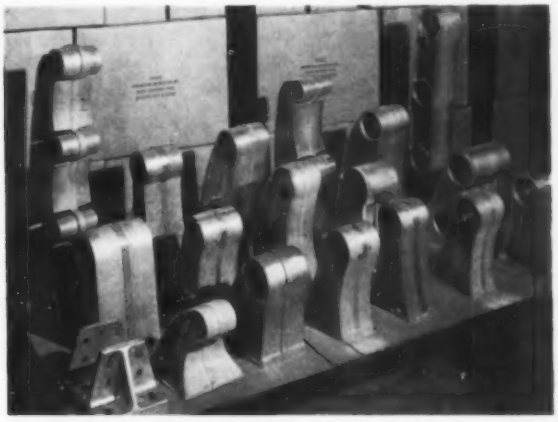
Now let's take the same accident where the posts are permanent mold cast aluminum and the railings are extruded aluminum tubing. When the car strikes the railing the posts and rails absorb

1. STILL HOT, the cast support is removed from the mold and sent to the trim line.

2. PARTING LINE flash and residual gate are ground off. The flange at the parting line eases grinding.



3. DRILLING AND TAPPING the set screw holes is done in a jig that accommodates several post designs.



4. FINISHED POSTS ready for shipment onto a highway bridge where they'll make driving safer.

energy up to the yield point. After that, instead of breaking they bend and take up a lot more energy in bending. Now the car is stopped, of course, but the stopping took longer, was gentler. The result is that the riders in the car are not thrown about as much. So, fewer deaths, less serious injuries.

Let's look now at some of the methods of manufacture and the alloy used by Monarch Aluminum Mfg. Co. in the railing posts they make for Reynolds Metals Co.

FABRICATING METHODS

Both sand and the permanent mold casting processes are used to make railing posts. Experience gained in finishing and installing them showed the desirability of permanent mold cast railing posts. The most important reason is the casting is stronger, more homogeneous, free of inclusions, blow holes, stress cracks, etc. Also, because of higher production rates, less machining to finish, and fewer rejects, the permanent mold cast posts cost about 25% less than a sand cast post of the same design.

ALLOYS

Most highway departments now specify alloy 356-T6, probably because of its high mechanical properties given in the data books. The alloy has high ultimate strength, good ductility, and good corrosion resistance. But it has one fatal disadvantage. It breaks when stressed above its yield point. What other alloy could be used? Well, 43 for example. Its yield strength is lower than 356, but when stressed above the elastic limit the cast 43 posts will bend when 356 posts break. Tests, run in cooperation with the Texas Highway Dept., showed that the more ductile alloy absorbed much greater impact loads, if the post was properly designed.

DESIGN

Almost every highway department has its own preferred designs. Most of these are good but lead to higher than necessary costs because production quantities are low and the most efficient foundry methods can not be used. If the different highway departments could agree on a few good designs, then costs can be cut.

PRODUCTION

Reynolds' high production requirements call for maximum mechanization in the foundry. Monarch designs molds for the least possible hand work. The metal is continuously melted. Pouring is

continued on next page

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Latrobe
Die
Casting Co.
Latrobe, Pennsylvania

Established 1918

fully automatic. Even though they're made of aluminum, with every possible weight saving incorporated, the castings are fairly heavy; so they're handled almost exclusively on conveyors.

From the casting floor the posts go to clean-up where gates are removed and flash, if any, taken off. Next comes heat-treating to get the proper physical and mechanical properties before final machining.

MACHINING

The cored holes into which the railings fit are cast to tolerances of $\pm 1/32''$. At this accuracy, only flash needs to be removed to finish the holes. This is done mechanically.

The rails must be anchored in the posts. Two set screws at each rail opening do this. The set screw holes are drilled and tapped at high production rates. Special machines and jigs are used. They are flexible enough to take posts of different sizes and designs.

SURFACE FINISHING

The castings, after heat treatment and machining, may have a mottled grey appearance and will have various shop soil on the surface.

Most highway specifications require that the posts and railings have a permanently bright finish for high light reflectivity. This helps to make night driving safer. Also, the posts would match the extruded rails for best appearance and must be highly corrosion resistant.

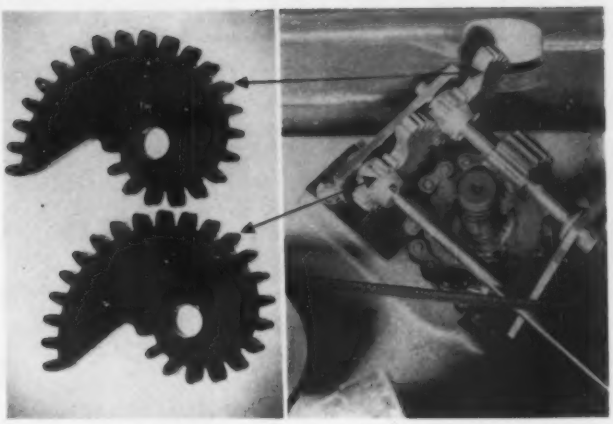
A further complication is that without the right surface finish the posts may become soiled during erection. Often the posts are only degreased, then sand blasted. This gives a pleasing appearance, but the finish is fragile and soil which accumulates during erection can not be removed. Even when the posts are lacquered, after sand blasting, the good looks don't last. After a short time, out in the weather, the lacquer will peel and chip making the post unsightly.

Monarch has developed a proprietary finish which gives the desired bright, highly reflective surface. It is immune to soil and stain from handling during erection. It does not deteriorate when exposed to the atmosphere for long periods.

For more information circle No. 34 on the Reader Service Card

DESIGN FOR
DIE CASTINGS

Expensive Gears? – Die Cast 'Em



CAST, TRIM & ASSEMBLE, that's the story on these variable pitch gears. Only die casting could do this job at a tolerable cost.

HOW'D you like to cut gears with 23 teeth no two of which are the same shape; with pitch radii varying from 0.240″ to 0.840″; with the teeth undercut and none converging at a common center? What's more, they have to work from fixed centers on non adjustable shafts. The loosest tolerances that could be allowed on the gears are ±0.001″.

Now complicate the problem by requiring the gears in fairly large quantities at low cost. It just can't be done any way except by die casting.

The gears are used by Minnesota Mining & Mfg. Co. in its Thermofax® copying machines. At first the gears were either machined from stock or cast by non die methods. But as production of the copying machines grew the rates of production and the cost per gear required some other method. Now, Twin City Die Casting Co. makes them in zinc. As cast accuracy is adequate, reproducibility from gear to gear is excellent and cost is only a fraction of what it used to be. The sequence of operations is now cast, trim and assemble.

Serving the Die Casting Industry

SINCE 1944 . . .

with . . . a complete line of interchangeable replacement parts for the injection end of aluminum and zinc die casting machines

AND NOW A

COATED THERMOCOUPLE TUBE*

has been added to OUR LINE OF ENGINEERED PRODUCTS:

Goosenecks, Nose Inserts, Plungers, Piston Rings, Plunger Couplings, Nozzles, Machine & Breakdown Pots.

Shot Sleeves, Plunger Tips, Plunger Rods.

Complete rework service on goosenecks, plungers, shot sleeves and plunger tips.

R·B

For All Types & Sizes of Die Casting Machines

*This tube has been immersed in aluminum over 1000 hours with no evidence of destruction or failure.

Rex-Buckeye Co.

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NOW by LITEMETAL
DIE CASTINGS IN ALL 3

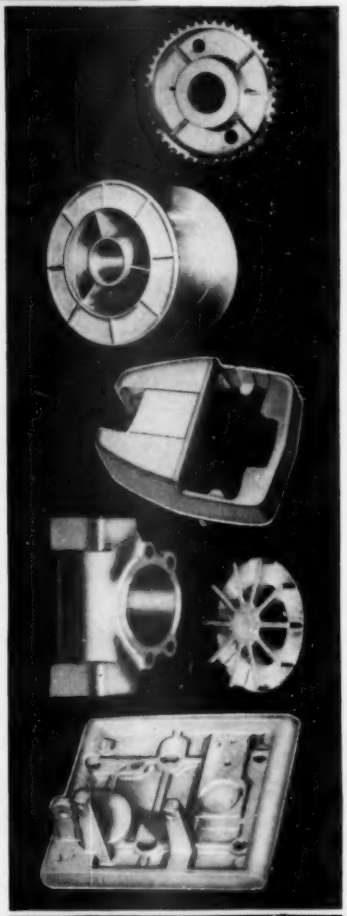
ALUMINUM · MAGNESIUM and ZINC

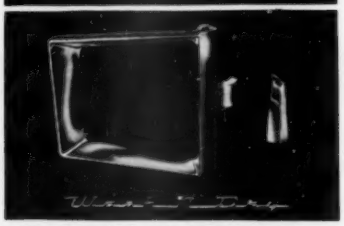
Our expanded facilities now establish LITEMETAL as one of the few companies actively producing Die Castings from Aluminum, Magnesium and Zinc. All departments are completely equipped with modern and powerful casting machines and trim presses. Zinc Die Castings are produced in a completely isolated building to prevent any possible alloy contamination.

To the right are shown a few of the wide range of products die cast by LITEMETAL for such diversified fields of manufacture as Chain Saws, Textile Spools, Office Equipment, Aircraft and Electronic Parts.

SERVICE • with • SKILL

Zinc Die Castings, shown in bottom panel, include a Refrigerator Handle, Control Knob and Script Nameplate. Additional facilities include plating and finishing to hardware standards. For example, through our affiliate, Namco Division of Hayes Industries, Inc., the handle was chrome plated, the knob and nameplate brass plated and lacquered to simulate gold . . . an integrated time-saving service, coupled with LITEMETAL skill and efficiency.





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PLANT AND EXECUTIVE OFFICES

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STRESSED SINTERINGS

continued from page 29

the spring hook slot. This was a slow tedious, machining operation that took special, expensive tools and skilled labor. The labor cost is what finally led to the decision to use sintered hubs. Once the decision was made the company immediately stopped making the machined hubs. While waiting for the sintered hub to be tooled up, they used machined castings as a stopgap measure. Even this was cheaper than having to foot the labor bill for the fully machined part.

The difference in the amount of machining required for each method represents a savings of 90%. Two other factors helped to reduce unit cost. First, was the discovery that one short sintered hub would perform just as well as the long machined hub. This saved material. Second, the company realized a savings by not specifying close tolerances that weren't needed. It would have been possible to hold tolerances as close as ±.001", but the company specified ± .002" which was all that the part needed.

ALAN WOOD TO PUSH METAL POWDER RESEARCH

In a move to increase the usage of iron powder, the ALAN WOOD STEEL CO. has appointed Dr. Arthur B. Backensto, Jr., as research metallurgist. Dr. Backensto will work closely with customers and potential customers for iron powder.

GLIDDEN CO. SETS UP NEW WEST COAST DISTRIBUTION

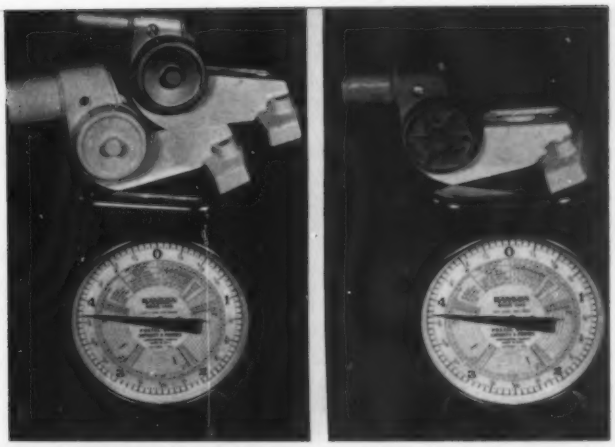
Due to the steadily expanding number of customers in the west-coast area, THE GLIDDEN CO., CHEMICALS-PIGMENTS-METALS DIV. has established its own offices there. This will permit the distribution of the division's products more directly.

Ralph B. Quelos, eastern sales manager, will also manage sales for the new division. William Ellis will cover the San Francisco area, and Fred Downer and M. Bonham the Los Angeles territory.

Primary products of the division are titanium dioxide, lithopone, copper oxides.

DESIGN FOR
DIE CASTINGS

Save Weight – Save Money



TWO FOR ONE in both weight and cost. That's the record set when die castings replace grey iron sand castings.

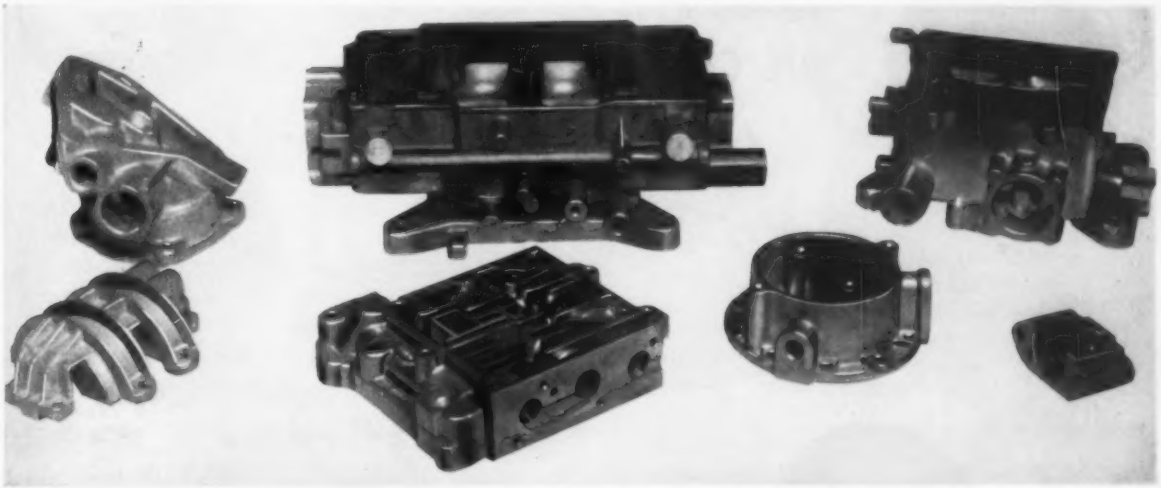
BY changing from a grey iron sand casting to a zinc base die casting for a part of a hair drier, Martin Brothers Electric Co. cut the weight of the part by 50%. This is important since the driers are shipped all over the United States, Canada and South America and to slice off almost two pounds in weight makes a big difference in shipping charges.

But, even more important, the finished part cost was also cut by at least 50%. Here's how the savings were gotten.

First, the cost of the casting as delivered from the Cleveland plant of Ainsworth-Precision Casting Co. is lower as a die casting than as a sand casting. Most of the casting cost is in labor and the much faster rate of production showed enough saving to more than compensate for the slight increase in material costs.

But the big saving came in finishing the castings. Nine holes had to be drilled in the sand casting, they're cored in the die casting. Wall thicknesses were reduced and no machining stock to bring the part into tolerance had to be allowed when the piece is die cast because normal shop tolerances are good enough for this piece.

The preferred surface finish is paint. With a sand casting the entire outside surface had to be ground or sanded, but except for touching up at the parting line and other minor areas where the die casting is trimmed, no surface finishing has to be done on the die casting.



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Specialists in Die Cast Dies — Plastic Molds — Powder Metal Molds — Wax Molds for Investment casting.

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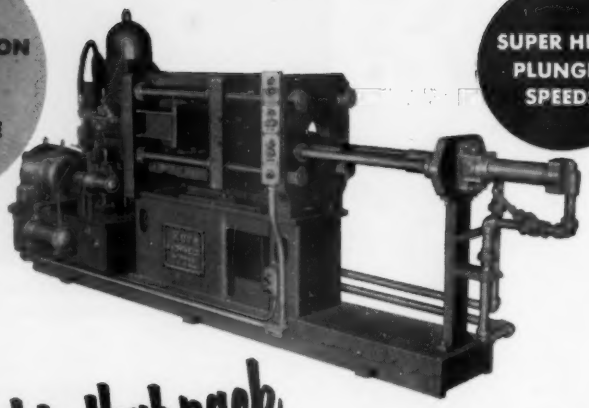

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SPEEDS

SUPER HIGH
INJECTION
PRESSURES

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COLD CHAMBER
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Middleweights that pack the power of heavyweights!

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UP TO 24" x 24"
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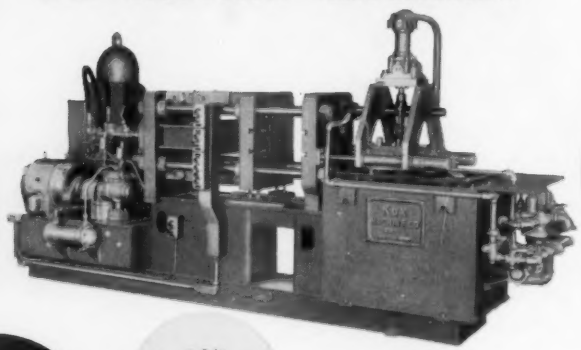
PER HOUR



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WITH MINIMUM
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STROKE

Models HP-12 and BH-12 have 100 tons die locking pressure and 12¼" x 15¼" clearance between bars.

Models HP-15 and BH-15 have 200 tons die locking pressure and 15¼" x 15¼" clearance between bars.

KUX MACHINE COMPANY

6725 North Ridge Avenue, Chicago 26, Ill.

To get the complete story now on these two new hydraulically operated Kux die casting machines, write for catalog today.

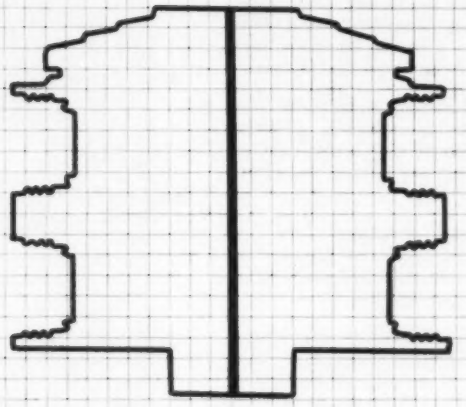
Builders of a full range of die casting machines . . . from 25 tons to 1000 tons in size.

For more information circle No. 31 on the Reader Service Card

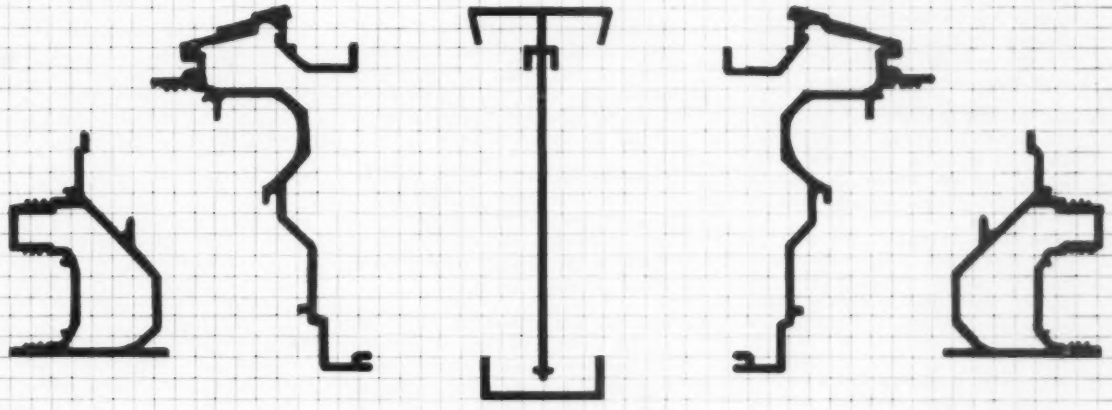
EXTRUSIONS

When large complex sections are needed, these extrusion tricks might be your solution.

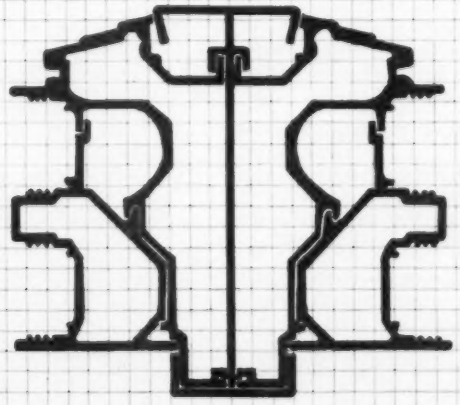
use these **Design Tips** for lower costs -better products



Problem: To make this complex section in long lengths.



Solution: Six extruded sections of four different shapes.....



assemble to give this.

Courtesy: Reynolds Metals Co.

PMM DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

1. **Lubricating Problems?**—Bulletin 426 From Acheson Colloids Co. presents technical data on how the company's line of dispersions may be the answer to your lubricating problem.

2. **Melting Furnaces**—Engineering data is available on the 60 cycle induction melting furnaces of the Ajax Engineering Corp. The furnaces range in size from 20 kw to 2000 kw and will produce from 150 lbs. to 40 tons per hour.

3. **Dies & Related Tooling**—Complete facilities list and technical literature is available on dies, hydrotels, pantographs, rotary head mills and jig mills produced by the Alliance Mold Company, Inc.

12. **Sintering**—The "Engineering Handbook of Powder Metallurgy", and Catalog No. 58, which lists 2,227 sizes of completely finished cast bronze and sintered oil-filled bearings, are available from Bunting Brass & Bronze Co.

13. **Small Die Casting Machines**—A brochure from Cast-Master, Inc. gives details and specifications on two die casting machines: the 7Z for zinc, tin and lead; and the 7A for aluminum, magnesium and brass.

15. **Die Casting Machines**—Technical data from Cleveland Automatic Machine Co. gives the specifications for 50, 200, 400 and 600-ton die casting machines for zinc and aluminum.

19. **Spue Bushings**—sprue spreaders, ejector pins, and cavity retainer sets are described in literature from the Detroit Mold Engineering Co. Complete specifications and prices are included.

20. **Investment Casting Cores**—Du-Ceramic, a new material for investment casting cores, is described in technical literature from Du-Co. Ceramic Co.

22. **Multiple Spindle Heads**—for drilling or tapping on any drill press. Catalog from Ettco Tool & Machine Co., Inc. lists fixed spindle, geared adjustable, and Knuckle-Head adjustable heads.

23. **Die Casting Compounds**—and other specialty lubricants and coolants are described in bulletins offered by Fiske Bros. Refining Co.

24. **Die Castings**—"Small Zinc Die Castings Exclusively", is the title of a new bulletin from Gries Reproducer Corp. The company's method for delivering parts of high uniformity, with close tolerances, is explained.

25. **Die Casting**—"Behind the Scenes" is a brochure from Hampden Brass & Aluminum Co. on their complete facilities for meeting your die casting requirements, regardless of part size.

26. **Zinc Alloy Facts**—"Reference Book and Guide on Zamak (Zinc Base) Die Casting Alloys", offered by Henning Bros. & Smith, Inc. gives valuable production and design data.

27. **Holding Furnace**—Bulletin 150, from Hevi-Duty Electric Co., describes the company's new quiet, safe, resistance holding furnace for aluminum.

31. **Die Casting Machines**—Two new hydraulically operated casting machines are described in a catalog issued by Kux Machine Co.

35. **Die Casting Machines**—Information on a complete line of die casting machines is available from Lester-Phoenix, Inc. The machines feature reliable clamping, and are readily adapted to vacuum die casting.

36. **Die Castings**—Literature and design information is available from Litemetal Dicast, Inc. on aluminum, magnesium and zinc die castings. Their facilities for producing parts of any size are described.

41. **Tumbling Media**—A new abrasive that licks the barrel finishing problems of discoloration, impingement and fracturing, is presented in a technical booklet from Minnesota Mining & Mfg. Co.

45. **Zinc Die Castings**—The "End Uses of Zinc Die Castings", a 62-page booklet on the uses of zinc die castings in American manufacturing, is available from The New Jersey Zinc Company.

46. **Cutting Costs**—with brass powder metallurgy. This is the theme of a booklet evaluating this production method in terms of particular needs. The New Jersey Zinc Co.

47. **Plaster Mold Castings**—How you can produce small parts to the most exacting tolerances, for just a few parts or a production run, is discussed in an illustrated booklet from Ohio Precision Castings, Inc.

50. **Cleans, Lubricates**—That's what the Air-Lube System, manufactured by Pierce-Waller, Inc., does. Data folder describes this system that removes loose flash with an air blast, then lubricates mold surfaces evenly.

51. **Vacuum Die Castings**—Literature on vacuum die castings and the Premier Die Casting Company's facilities for producing custom castings to your specifications, is available from the company.

52. **Die Casting Facilities**—A brochure from Paramount Die Casting Co. describes their facilities for producing your specialized casting.

54. **Sintering Savings**—A brochure, "How To Cut Costs With The Remet Powdered Metal Process", is available from Reese Metal Products Corporation.

56. **Iron Powders**—If you design or fabricate iron powder parts, you'll be interested in this 48-page book from Republic Steel Corp., entitled "Technical Information on Republic Iron Powders".

58. **Fire-Resistant**—hydraulic fluids composed of water and synthetic materials. A 6-page data booklet from the D. A. Stuart Oil Co. describes how these fluids are formulated to provide corrosion protection and effective lubrication. Specific properties, test data, etc. are included.

61. **Stainless Steel Ladles & Skimmers**—which are 75% lighter than cast iron and have extremely long life, are described in literature from Spincraft, Inc.

66. **Temperature Instruments**—Bulletin COM, from West Instrument Corp., describes the company's line of controllers, indicators and recorders for temperature and other variables.

68. **Fire-Resistant Hydraulic Fluids**—the booklet, "Ucon Hydrolubes Spell Safety", from Union Carbide Chemicals Co., gives detailed information. Laboratory test results and service records are given.

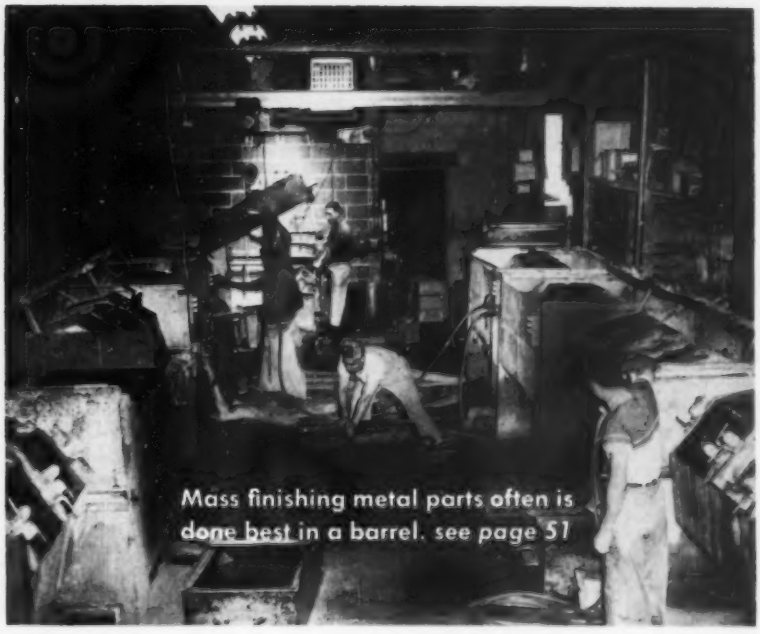
72. **Rubberized Abrasives**—An 8-page catalog is available on rubberized abrasives for deburring, smoothing and polishing tools, dies, patterns, molds, etc. Cratex Mfg. Co., Inc.

74. **Coatings**—for chemically polishing, deburring and protecting zinc and aluminum die castings are described in technical data sheets from Heatbath Corp.

77. **Electrostatic Spray Painting**—Literature is available on the Ransburg No. 2 Process Electrostatic Hand Gun that has been proven in a variety of installations. Ransburg Electro-Coating Corp.

PMM Finishing Section

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.



Mass finishing metal parts often is done best in a barrel. see page 51

(Advertisement)

Special Reports On Finishing Non-Ferrous Metals

NUMBER II—Paint Base, Corrosion-Resistant Finishing with Iridite

WHAT IS IRIDITE®

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a good paint base and decorative finishes for non-ferrous metals. However, continued developments have been so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can obtain proper surface preparation for painting and increase product durability with a single multi-purpose chemical pretreatment. Report I on decorative, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, it is an accepted fact that metal surfaces should be prepared before painting to make possible an efficient paint system. Naturally, this preparation should provide for good initial paint adhesion. Chemical treatments have proved extremely effective in this respect, particularly those of a neutral or preferably acid nature. Further, to be most efficient, chemical treatments should provide a non-porous barrier to maintain adhesion by sealing the metal from the paint and moisture. They should also provide a self-healing film which prevents lateral corrosion in the event that bare metal is exposed through scratching.

The Iridite chromate conversion coatings meet all these requirements. Iridite is a chemical conversion treatment for surface preparation. It provides initial paint bonding by molecular adhesion. It is acid in nature and produces a film that is gel-like and non-porous in structure. Thus, the Iridite film effectively seals the metal from the paint and from moisture penetration. Because the film contains certain relatively soluble constituents, it will protect areas scratched through to bare metal and prevent lateral corrosion. This is accomplished by a gradual leaching of these constituents into the damaged area.

Further, because of its gel-like, non-crystalline nature, the Iridite film will not affect the appearance or texture of the paint film, nor will it dust or powder to mar the painted surface. Because the film is non-porous, paint coverage is increased, thus substantial savings in paint costs will be realized. In addition, treated parts may be stored for long periods of time prior to painting without the risk of entrapped moisture causing blistering when painting.

Iridite chromate conversion coatings are widely used with equal ease and success under both baked and air-dried paint systems. While the actual adherence properties of the Iridite film do not increase appreciably with its thickness, corrosion protection does. The protection of the Iridite film is proportionate to its thickness and should be taken into consideration when selecting the Iridite to meet your needs. However, it is sometimes necessary to sacrifice maximum corrosion protection for appearance when a finished part is to be only partially painted. For example, it may be desirable to use a thin, clear, bright Iridite film if the unpainted areas must present a chrome-like appearance. A typical case is that of instrument housings on which the exterior is painted and the inside left unpainted.

On the other hand, if all surfaces of the product are to be painted and maximum corrosion protection is required, the heavier and most protective Iridite films should be used. For example, all surfaces of zinc die cast fruit juicers are finished with a highly protective Iridite film prior to painting to provide maximum resistance to the corrosive action of fruit juices.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. In addition to providing an excellent base for paint, the Iridite films also have high decorative value when used as final finishes in themselves.

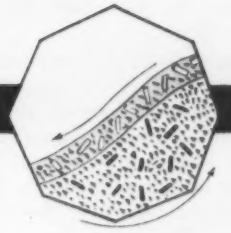
These films can produce a wide variety of pleasing appearances including clear bright, iridescent yellow, bronze, olive drab and brown. In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to their functions as protective and decorative finishes, and as bases for organic finishes and bonding compounds, Iridites have low electrical resistance. Some can be soldered and welded. The film does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

For more information circle No. 69 on the Reader Service Card



PART NO.	OPERATION NO.	DESCRIPTION	MATERIAL

BARREL FINISHING PROCESS CARD

CUSTOMER'S SIZE MAX. NO. PARTS or LBS.

OPERATION	MEDIA			COMPOUND		WATER HEIGHT	RPM	LOADING TIME	RUNNING TIME	RINSING TIME	UNLOAD'G TIME
	TYPE	SIZE	HEIGHT WEIGHT	TYPE	AM'T						
CLEAN REMOVE OIL											
CUT											
DESCALE											
NEUTRAL-IZE											
POLISH or HONE											
BURNISH											
SEPARATE											
OTHER											
DRY	OIL DIP CORN COB CENTRIFUGAL OTHER		TIME								

1 ACCURATE RECORDS of every job are essential if repeat work is anticipated and to furnish some background. This is a typical work card used by many finishers.

Some Tips On Barrel Finishing

MUCH of the knowledge about finishing metal parts in barrels has come only through experience. There seems to be no "science" to the business, rather it is strictly an art.

If this is true, the only way a newcomer in the field can learn is by making mistakes, and this can be expensive. While no rules can be laid down about how to finish parts in a barrel, there are a few guide posts.

An interview with Bernard A. Farmer of Ohio Hydro Deburring Co. developed a number of generalities that should be useful to operators of barrel departments.

Q. How much of the barrel volume should be used for parts and chips?

A. Generally about 60%. On a 19.5 cu. ft. barrel use about 12 cu. ft. for media and parts.

Q. What's the best general ratio of media to parts?

A. As a starter use ¼ the volume for parts and ¾ for media. In the 19.5 cu. ft. barrel this would be 9 cu. ft. of media and 3 cu. ft. of parts.

Q. How do you tell if the finishing is going allright?

A. Stop the barrel about every fifteen minutes and check progress. If there's evidence of impingement the ratio of parts to media is too high. If there's evidence that finishing is not going on, the total load of media and parts may be too great so that the desired sliding action isn't taking place.

Q. How do you determine the best barrel speed and time?

A. That's strictly experimental. You have to watch progress and judge accordingly. Generally test runs are made in a small barrel. The results, when transferred to a large barrel, are not exact, but are probably 80% right. If you find peening of the parts the barrel speed is probably too fast; if there's evidence of necking the barrel speed is too fast.

Q. How do you pick the right media?

A. Again that's experimental, but there are a few guides. On ferrous metals, bonded aluminum oxide chips are generally used. On non-ferrous metals, media free of aluminum oxide, granite for example, gives the best results. The chief reason for this is that during finishing small particles of aluminum oxide wear off. These tend to impregnate the surface of the softer metals, harden the surface and stop finishing action. Media such as granite wears off as such a fine material that it doesn't impregnate. Incidentally, when the granite chips become too smooth for normal finishing operations they can be used for barrel burnishing. They're not quite as good as hardened steel balls for this job, but can be used.

Q. How do you select media size and shape?

A. This depends on the job to be done, whether there are any holes in which media could lodge and the quality of the finish desired. Generally, larger sized pieces of media will remove metal faster than smaller pieces, the grit being the same. If there are no guarded, or semi-guarded areas larger media can be used then when there are these areas. Also if holes are present in the metal parts the media should be small enough for more than three pieces to fit into a hole. One, two or three pieces of media will lodge. Of course, media pieces larger than the hole can also be used.

Q. How do you select the proper compound and how much do you use? What's the function of the compound?

A. First the function of the compound is mostly as a lubricant. It has some abrasive action, but this is relatively slight. The compound aids in the sliding action and helps to give a uniform finish. It also helps keep the media clean. As to selection of a compound, that's a matter of personal choice. All of the compound makers have a full line of materials and in general their recommendations can be followed.

Q. When do you use graded media and when media of a single size?

A. In the first place, understand that media is graded by size only, not by grit. Any single barrel charge has media of one grit only. For radiusing always use graded media. When there are semi-guarded areas, use graded media. Generally smooth areas are best finished with a uniform size media.

Q. How much compound should be used?

A. Generally about 2 ounces per gallon of water.

Q. What is the function of cleaners in barrel finishing?

A. Cleaners serve two functions. They keep metal sludge from filling the abrasive when bonded abrasive is used and hold metal and media sludge in suspension in the water. Cleaners, in combination with media and compound can also be used to remove oil, grease, scale, etc.

Q. Can a variety of operations be done at the same time? For example can cleaning, descaling, radiusing, deburring and polishing be done at the same time?

A. No. For best operations the oil and grease should be removed first. Then a barrel treatment using compound and media to remove scale and cut off heavy burrs. This operation can also be used for heavy cut-down if necessary. The parts must be thoroughly washed and rinsed after this treatment. A second step is then final deburring and polishing with either compound alone or with fine grit media and compound.

Q. How about using fixtures?

A. Some parts have to be fixtured, that's the only way they can be handled. If small barrels are available it is sometimes better to run one part at a time in a small barrel than to use a bigger one and make fixtures. No rule can be given for this, only experience will give the best procedure. Remember, however, if a fixture is used the direction of rotation of the barrel must be reversed half way through the finishing cycle.

Q. For a small shop just starting to do barrel finishing, what would be a minimum installation?

A. Usually a 2 cu. ft. barrel with 2 compartments. This will handle a wide variety of work as long as the parts are not very large. Such a barrel is not very expensive. In addition a tilting barrel for sawdust drying is desirable, this barrel may be heated. It will handle sawdust, maize, leather scrap and a wide variety of special drying and treating materials. In addition, adequate water supplies and drains have to be installed. Media separators, drain pans, etc. are necessary. Then as the work load increases more barrel units can be added. These may be larger barrels depending on the type of part to be finished.

Q. As the fininshing department grows what equipment will be needed?

A. For a large installation the barrels may run up to 28 cu. ft. capacity, generally 12 to 14 cu. ft. barrels are pretty standard. With these larger units a portable hoist and a monorail conveyor are very necessary. Media pans, mechanical shakers, media storage, oil dip tanks, hot sawdust barrels and other auxiliary equipment will be needed. In addition, as the size of the department and the complexity of the parts to be finished grows the need for more media storage and the water supply and drainage problems increase.

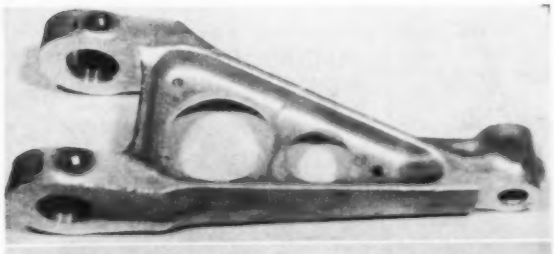
Q. How about records?

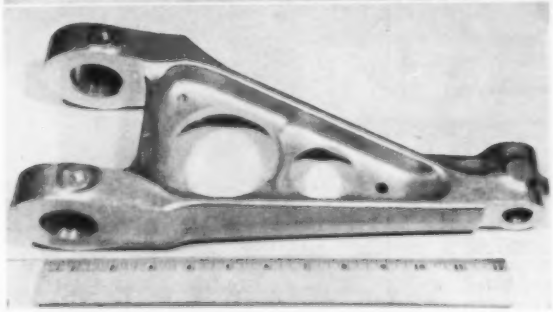
A. Keep as complete records as possible. Here's a process card (see fig. 1) that is typical of the kind used in barrel finishing departments. If possible, include a sketch of the part to be finished, or better yet, show before and after photographs.

Q. Finally, how about costs?

A. In almost every case barrel finishing is a lot cheaper than almost any other method. For example, here are five very different parts (figs. 2, 3, 4, 5, 6). All were barrel finished after some other method had been tried. All showed large savings.

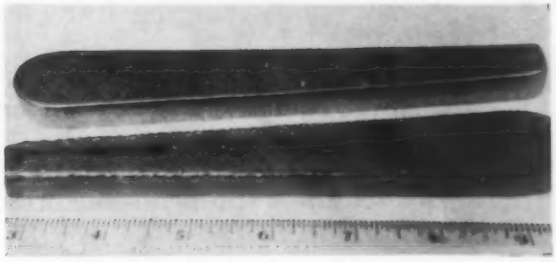
2 **CAST STEEL** elbows with machined flanges. Operations, clean, deburr, radius. (Unfinished top, finished bottom).
Cost to hand finish $0.65 each.
Cost to barrel finish $0.06 each.



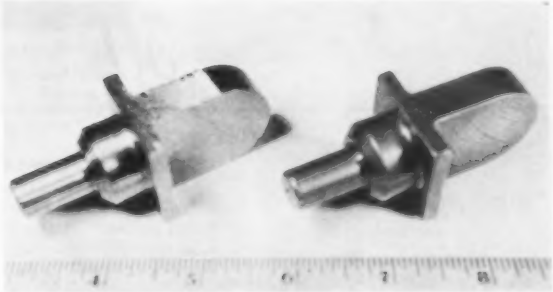


3 **CAST ALUMINUM** brackets. Operations, flash removal, deburr, improve finish. Drilled and reamed holes could not be marred. (Unfinished top, finished bottom).
Cost to hand finish $2.25 each.
Cost to barrel finish $0.14 each.

4 **STEEL RINGS** to be cleaned, radiused and deburred. Scale removal was originally a separate operation. Rough ring right, barrel finished ring left.
Cost to hand finish without scale removal $0.23 each.
Cost to barrel finish with scale removal $0.02 each.



5 **STEEL BARS** to be deburred, scale removed, radiused. With hand cleaning, scale removal was a separate operation. Rough bar bottom, barrel finished bar top.
Cost to hand finish without scale removal $0.30 each.
Cost to barrel finish with scale removal $0.04 each.



6 **SHELF SUPPORTS,** machined castings. Required cleaning, deburring, radiusing and blending of flat into end curve. Unfinished part left, barrel finished part right.
Cost to hand finish $0.80 each.
Cost to barrel finish $0.05 each.

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For more information circle No. 76 on the Reader Service Card

PURCHASING AGENT FOR QUEEN PRODUCTS DIV.

HEGMAN

Robert C. Trow, vice president and general manager of QUEEN PRODUCTS DIV. of KING-SEELEY CORP. has announced the appointment of Harold J. Hegman as purchasing agent. Mr. Hegman will be located at the company's Albert Lea, Minn. general offices.

JAWORSKI JOINS ENGINEERED PRECISION CASTING CO.

The new eastern district sales manager for ENGINEERED PRECISION CASTING CO. is Frank Jaworski. Formerly chief buyer and head of the tool procurement department at Eclipse Pioneer, Mr. Jaworski will take over in his new capacity after a three month training course in the manufacture of investment castings.

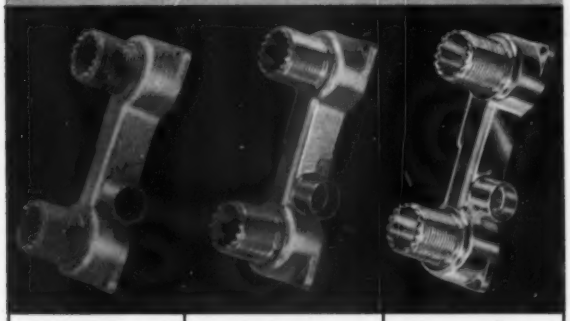
MACDERMID, INC. APPOINTS NEW RESEARCH CHEMIST

GRUNWALD

MACDERMID, INC., manufacturers of metal cleaning, plating and finishing chemicals, has appointed Jean J. Grunwald as research chemist. Mr. Grunwald received his B.S. from Polytechnical School University, Lausanne, Switzerland.

Duracoat®

for Die Castings



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DURACOAT® C. Liquid chromate product for producing bright, irridescent or golden protective finish on zinc die casting. Fast, simple, economical to use. Highest quality at lowest cost.

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He's leaving nothing to chance...

"How fire hazards can be avoided in hydraulic power systems!"

New, free booklet on Stuart's DASCO FR fire resistant hydraulic fluids shows you how this mixture of water and synthetic materials replaces petroleum base lubricants . . . describes how they are formulated to provide corrosion protection and effective lubrication.

It's a 6-page booklet containing detailed tables on specific properties, pump test data, and recommended procedure for converting your hydraulic system and reducing fire hazards.

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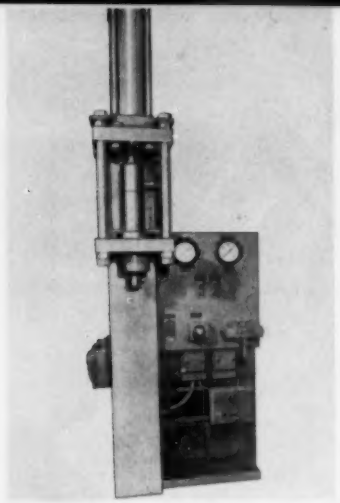
TORONTO (Scarborough)	Plymouth 7-3227

For more information circle No. 58 on the Reader Service Card



NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 48 of this issue

CERAMIC EXTRUDER . . . has 50-tons ram pressure at 2,000 psi.

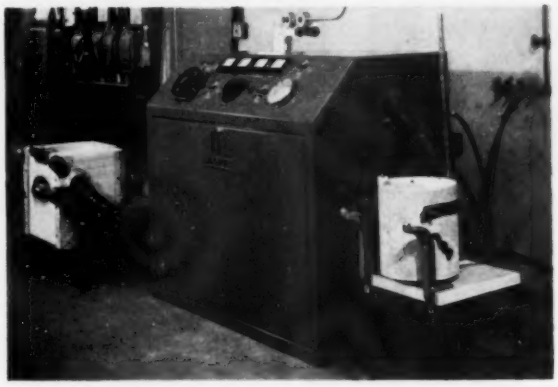
The Rel-Co 559 is a ceramic laboratory extruder with 50-tons ram pressure at 2,000 psi. It extrudes vertically to a maximum of 48" lengths or less. Developed by DU-CO CERAMICS CO., the extruder is mounted on a base that contains the hydraulic pumping unit, 30 gallon oil reservoir, de-airing pump and controls. The pumping system has a vane-type pump, operated by a 7½ hp. motor, that delivers constant pressure and volume through the control valve. Extruding and return speeds are push-button controlled.

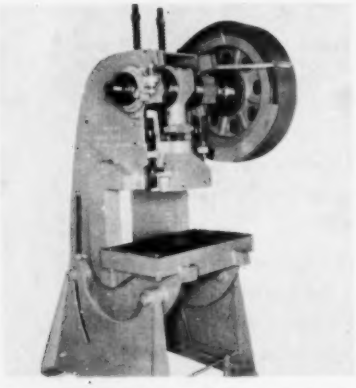
Circle No. 205 on Reader Service Card

INDUCTION MELTING UNIT . . . installs in 2 hours

INDUCTOTHERM CORP. has introduced the Integral 30, a console panel that contains the power source, controls and components necessary to the operation of high-frequency induction furnaces and coils. Included are a 30 kw. motor-generator set, a high-frequency transformer, and all necessary capacitors, meters and controls. The unit is installed by connecting it to a 220 or 440 volt power supply, a cold water line and a drain. Over 20 capacitor and 8 transformer steps assure matching full power to all varying load conditions during the melting or heating cycles. Applications are 100 lbs. capacity floor-mounted furnaces, vacuum furnaces, sintering and hot pressing.

Circle No. 206 on Reader Service Card





TRIM PRESS . . . can handle large or bulky die sets

Large or bulky die sets for die cast trimming, can be handled on this 40 Ton Press-Rite O.B.I. Press. Manufactured by SALES SERVICE MFG. CO., the press features a steel fabricated frame, heavily reinforced at vital points. This makes it possible to provide an extra large ram area, large bed area and extra depth of throat. The extra space permits handling of work that used to be placed on higher tonnage machines to obtain the necessary die space.

The press comes in flywheel or back-geared types. There is a choice of a mechanical or Airlex Air Friction Clutch. Other features include greater than standard shut height, and longer or shorter than standard 3" stroke.

Circle No. 207 on Reader Service Card

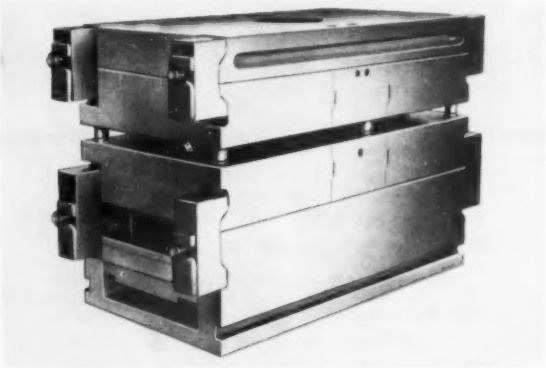
STANDARD-UNIT DIE ASSEMBLIES . . . are now available

Standard-unit die assemblies for zinc and aluminum die casting have been made available by the DETROIT MOLD ENGINEERING CO. The new unit-die construction enables the diecaster to replace cavities at minimum cost in a matter of minutes.

Three sides of the die are open for installation of cores or coolant lines. The twin replacement units are standard 9⅝" x 11⅞". The unit die holder includes a watercooled sprue bushing, sprue spreader, leader pins and wedge clamps. Rack-and-pinion or bumper-type ejector box assembly are optional.

Circle No. 208 on Reader Service Card

continued on page 58



HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

You get speedier service from the ZINC ZONE

Central location of American Zinc plants assures prompt deliveries of slab zinc to any point in the nation.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

American Zinc sales Company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY
Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

For more information circle No. 7 on the Reader Service Card

NEW PRODUCTS

continued from page 56

VACUUM INVESTING
. . . for precision casting

The vacuum investing machine, developed by CENTRIFUGAL CASTING SUPPLY CO., makes it possible to complete the entire investing procedure in one operation, while under vacuum. Advantages include freedom of gating. Blind hole and recesses are eliminated, allowing more patterns to be stacked in each flask. Because the investment is mixed and poured under vacuum, the patterns result in smooth castings, free of bubbles.

Circle No. 218 on Reader Service Card

LIQUID CARBURIZING FURNACE
. . . operates at 1700 F.

Four burner liquid carburizing, or cyanide furnaces capable of operating at temperatures up to 1700 F. have been introduced by the WALTZ FURNACE CO. The unit is 40" high. The alloy pot measures 18" in diameter and 24" deep. Four burners fire the pot tangentially. The furnace is used with a combination oil and water quench tank.

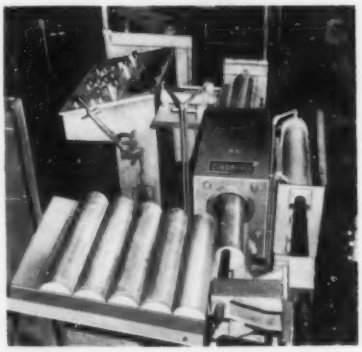
Circle No. 219 on Reader Service Card

HYDROGEN ANALYZER
. . . is compact

The Serfass Hydrogen Analyzer is a compact, easy-to-operate analyzer for measuring the amount of dissolved hydrogen in metals and other solid materials. Developed by the FISHER SCIENTIFIC CO., the unit will determine hydrogen in a typical 1-gram metal sample over a range of 0.2 to 1000 ppm. Precision is ±0.2 ppm.

Circle No. 220 on Reader Service Card

BILLET HEATER
. . . has precise control system



LINDBERG ENGINEERING CO., has introduced a induction billet heater that has a control system for heating aluminum billets to precise extrusion temperature. The "Metered BTU's" system measures watt-hour input to the billet with an integrating watt-hour meter and determines, with a totalizing timer, the amount of energy absorbed by the billet. A means is provided for compensating for the starting temperature of the billet. Thus, with a billet of known weight and known initial temperature, a predetermined amount of energy can be selected to heat the billet to the desired extrusion temperature.

Circle No. 223 on Reader Service Card

HEATER
. . . for extrusion dies

A die heater for aluminum extrusion dies is available from THE CARL MAYER CORP. The heater features close temperature control and is completely refractory lined. The work chamber is 24 x 24 x 18 inches deep. Temperature range is from 400° to 1000° F.

Circle No. 224 on Reader Service Card

SAFETY TONGS
. . . for broken crucibles

New lifting tongs and shank, that eliminate dangerous spills from broken crucibles and prolong cru-

Scores Greatest Popularity Gain in Finishing Metals!

SPIN-FINISH is only two years old, but is already an accepted method for finishing intricate design automotive, building, appliance and plumbing hardware. This revolutionary process produces in quantity surfaces and lustre equal to or surpassing that of buffing. Spin-Finish is a completely dry process. It is dust and fume free, and requires no set-up time!

Call on the free help of Grav-i-Flo engineers for savings in your finishing operation!

GRAV-I-FLO CORPORATION • DEPT. PM 3 • STURGIS, MICHIGAN

For more information circle No. 73 on the Reader Service Card

cible life, are being marketed by INDUCTOTHERM CORP. The tongs grasp the crucible around the base. This prevents bottom failure if a crack occurs. The crucibles are not subject to the strains imposed by conventional center lifts. The pouring shank fits the base of the crucible so the load is borne from the bottom.

Circle No. 225 on Reader Service Card

MEDIA SEPARATOR
. . . has vibrating screen

ROTO-FINISH CO. has introduced a separator that features a vibrating unit. It imparts high frequency, low amplitude vibrations to the screening mechanism. This makes more efficient separation and screening of processed parts and rescreening of media sizes possible. The separator has a 18" x 48" screening surface and handles all standard screen mesh sizes.

Circle No. 211 on Reader Service Card

HYDRAULIC LIFT-TABLE
. . . for die handling

A portable hydraulic lift-table has been introduced by the LANGELIFT CO. One of its many uses is for handling and transporting heavy dies to and from a machine or in setting up presses. Models from 1000 to 6000 lbs capacity are available from the company.

Circle No. 221 on Reader Service Card

THERMOCOUPLES
. . . are transparent

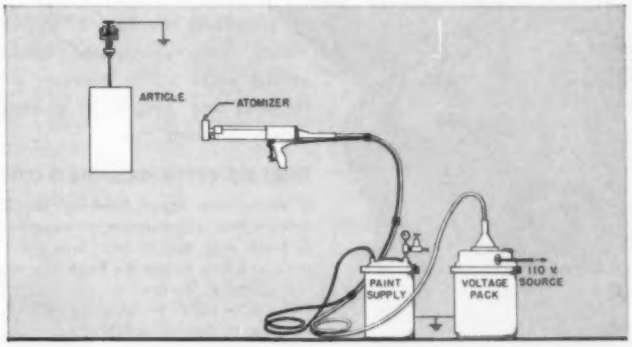
Immersion thermocouple protection tubes, that are transparent throughout, have been introduced by CHARLES ENGELHARD, INC. The thermocouples are principally for *continued on page 60*

Here it is—— The PAINTING TOOL ALL Industry has been waiting for!

The NEW

RANSBURG

NO. 2 PROCESS ELECTROSTATIC HAND GUN



CUTS PAINTING COSTS!

Saves Paint because there's no waste. Now, for the first time, the high efficiency of Ransburg's No. 2 Process automatic equipment is available to you in the NEW Electrostatic Hand Gun.

Saves Labor, Increases Production because it is faster on many types of articles such as those fabricated from perforated and expanded metals, tubing, rod and wire. This is due to the "wrap-around" nature of electro-spray which paints ALL sides of such articles from one side only.

Saves in Equipment because no conventional spray booth is required—no water-wash, no sludge recovery! Uses no compressed air for atomization.

Saves Building Heat Loss because only mild ventilation for removal of solvent vapors is necessary, and . . .

Maintenance Costs Are Cut because clean-up and maintenance labor is only a fraction of that required by other, less efficient painting methods.

See how YOU can save in your own finishing department, and at the same time, improve the quality of the work. Write for literature and information showing how the Electrostatic Hand Gun has been proven on different products in a variety of industrial plants.

Call or write

RANSBURG
Electro-Coating Corp.
Box-23122, Indianapolis 23, Indiana

For more information circle No. 77 on the Reader Service Card

HIS JOB

....TO BUILD
YOUR PROFITS!

THE *Roto-Finish* CUSTOMER'S MAN

There's nothing unique about stressing product quality. But, at Roto-Finish we have an added incentive. The success of the Roto-Finish Customer's Man *depends* on providing the kind of dependable, mass-production finishing service which builds customer satisfaction, and results in a steady repeat business.

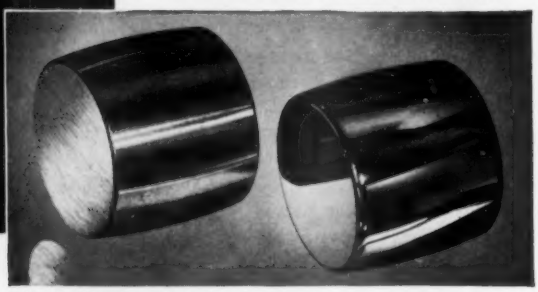
TRIAL AND ERROR FINISHING IS COSTLY

If you're now barrel finishing, our Customer's Man will welcome an opportunity to work with you in your own plant to show you how to get the finish you want, faster, and at lower cost.

If you're hand finishing, he can show you how to save up to 80% of your present finishing costs.

WANT PROOF? Then write or phone your Roto-Finish Customer's Man today.

ROTO-FINISH CASE HISTORY



*This photo is unretouched.
**MATERIAL: Bearing steel, 61 Rockwell C Scale.
DIMENSIONS: 1.213" dia. x 1.015".
FINISH BEFORE: Ground to 10 RMS.
FINISH AFTER PROCESSING: 2 to 4 RMS,
(with no dimensional change).

Roto-Finish COMPANY
3716 Milham Road
KALAMAZOO, MICHIGAN
Phone: Fireside 3-5578

ROTO FINISH

FOREIGN REPRESENTATIVES: ARGENTINA—Taller—Buenos Aires ● AUSTRALIA—A. Flavell Ltd.—Cheltenham ● BRAZIL—Commercial E. Industrial de Fornos Werco, Ltd.—Rio de Janeiro ● CANADA—Canadian Hanson & Van Winkle Co., Ltd.—Toronto ● ENGLAND—Roto-Finish Ltd.—Hemel Hempstead ● FRANCE—Societe Roto-Finish—Paris ● GERMANY, AUSTRIA, NORWAY, SWEDEN, SWITZERLAND—Metallgesellschaft A. G.—Frankfurt, a. M.—Germany ● HOLLAND, BELGIUM, LUXEMBURG—N. V. Roto Finish Maatschappij—Delft, Holland ● ITALY—Societa Roto-Finish a R. L.—Milan ● SPAIN—Instituto Electroquimico, S. A.—Barcelona

For more information circle No. 78 on the Reader Service Card

NEW PRODUCTS

continued from page 59

measuring molten metal temperatures. Being transparent enables users to accurately place in them the platimum tips of the heat-measuring devices prior to insertion in molten metal. They will withstand temperatures in excess of 2,500 F.

Circle No. 217 on Reader Service Card

POLISH & BUFF
. . . on one machine

The UP-2 abrasive belt polishing head, introduced by HAMMOND MACHINERY BUILDERS, INC., makes it possible to polish and buff on one machine. The head, designed for use on the company's OK, RL and ROL polishing lathes, offers the advantages of a contact wheel, free belt, and platen grinding and finishing. The head is recommended for light to medium duty polishing and can be furnished on either or both sides of the lathe.

Circle No. 212 on Reader Service Card

COBALT TOOL STEEL
. . . for trim dies

PRK-33, a high carbon, high chromium, air hardening, nondeforming tool steel, is being offered by DARWIN & MILNER, INC. in three new sizes: 3" x 7", 4½" x 6" and 4" x 10". The cobalt gives PRK-33, its outstanding wear resistance and strength, making it ideal for all kinds of high-production dies.

Circle No. 209 on Reader Service Card

ANODIZING RACKS
. . . are reusable

These all-titanium anodizing racks can be revised to accommo-

continued on page 75

DESIGN FOR
INVESTMENT CASTINGS

FUNCTIONALLY RIGHT, lower in cost. That's why investment casting beats machining.

Eliminate Milling – Cut Costs

PARTS as complex as the power shaft for a 35 mm movie camera are a production man's headache. Sure, they can be made in several different ways, but at what cost.

You can machine the shaft out of bar stock, but that takes both screw machine work and complex milling. Special jigs or fixtures are needed and so are form cutters.

You can machine a sand casting or a forging. Here, again, special tooling is needed as well as either patterns for the casting or forging dies; both are expensive.

The best production method was found by Casting Engineers, Inc., as an investment casting.

The shaft is cast in chromium-nickel-molybdenum steel. To show an appreciable saving tolerances on some dimensions had to be held to ± 0.002 in some cases and ± 0.005 in others. Some of the dimensions which had to be held the most accurately are on the most difficult to machine areas, this increased machining rejects, but didn't have much effect on the investment casting.

Some final machining has to be done on the cast part. But that is only hole drilling, cheap and easy.

The shaft now costs less than one-third the original cost.

Developed to Meet Every Pre-Painting Requirement

PHOSPHATING
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Let Us Make Recommendations
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For more information circle No. 75 on the Reader Service Card

ANNOUNCING

The new **CRATEX**
TOOL & DIE MAKERS KIT

The world's finest rubberized abrasives for deburring, smoothing and polishing tools, dies, patterns, molds, models, instruments and component parts.

Kit contains 80 wheels and points in the most popular sizes and shapes, equally assorted in four grit textures, coarse (C), medium (M), fine (F), extra fine (XF)... plus four mandrels for ⅛" chuck... packaged in plastic box, compartmented for fast selection. $7.50 complete.

Order your new Cratex Tool & Die Makers Kit #777 through your distributor – or, send your order to us for delivery by the Cratex distributor nearest you.

CRATEX *Free 8-page catalog available on request.*
MANUFACTURING CO., INC.

1600 ROLLINS ROAD, BURLINGAME, CALIFORNIA

For more information circle No. 72 on the Reader Service Card

NEW FROM "3M"

A super-speed abrasive that licks all three barrel finishing problems!

1. **DISCOLORATION** You get the world's *cleanest* workpiece surfaces with HONITE "C-R" Tumbling Shape. Its unique binder resists wetting as it wears away—won't attract or unite with dirt; doesn't cling to the workpiece.
2. **IMPINGEMENT** HONITE "C-R" Tumbling Shape will not nick or impinge surfaces or edges of work. It's *super-light* to produce superior micro-inch surface finishes, smooths off edges and radii in record time. Burrs are cut off before they can be peened over!
3. **FRACTURING** New HONITE Brand "C-R" Tumbling Shape *will not* fracture or fragment in the barrel. This virtually eliminates the annoying problem of lodging of media particles in pockets or threads of workpieces.

All this plus a cutting speed unsurpassed by any abrasive chip on the market today!

A truncated-triangular-pyramid designed to reach the most inaccessible workpiece areas.

Honite BRAND

"C-R" TUMBLING SHAPE

GET THE COMPLETE STORY:

Find out yourself how, for the first time, you can now get these characteristics combined to such a high degree in one tumbling medium. Use this coupon.

MINNESOTA MINING AND MANUFACTURING COMPANY

3M COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

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Send me free copy of Technical Booklet,
"HONITE" Brand C-R Tumbling Shape.

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

For more information circle No. 41 on the Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 48-49

PROCESSES

Extrusions: 154

SOUTHERN EXTRUSIONS, INC.—Illustrated brochure gives available alloys, mechanical specifications, and standard tolerances for aluminum extrusions.

Investment Casting: 155

CASTING ENGINEERS, INC.—Engineering data on the Minicast process that provides tolerances of ±0.001", and cross-sectional thickness as low as 0.032, is available.

Zinc Die Casting: 156

THE NEW JERSEY ZINC CO.—"The End Uses of Zinc Die Castings", is a 62-page booklet containing 192 photographs on the uses of zinc die castings in American industry.

Extrusions: 157

JARL EXTRUSIONS, INC.—Catalog No. 2 lists stock and standard solid, hollow and semi-hollow shapes for industrial and architectural applications.

Shell Mold Castings: 158

PRECISION MFG. CO.—The process is explained, with pictures, from pattern to finished casting. The company's facilities are given.

Drafting Standards for Extrusions: 159

THE ALUMINUM ASSOCIATION—This 100-page engineering data book gives the specific drafting practices that are necessary with aluminum extruded products.

Plaster Mold Castings: 160

ATLANTIC CASTING & ENGINEERING CORP.—The plaster mold process is described. Technical data and characteristics are given with examples of actual parts cast by this method.

Investment Casting: 197

SIGOURNEY MFG. CORP.—"Precision Vacuum Cast Alloy Castings", is the title of a technical brochure on company's production of investment castings employing the latest vacuum metallurgy.

MATERIALS & EQUIPMENT

Cobalt: 161

COBALT INFORMATION CENTER—Technical data on the element, on electrical and magnetic properties, mechanical properties, transformations, diffusion, etc., is available.

Extrusion Dies: 162

PMD EXTRUSION DIE CO., INC.—The company's facilities for producing all types of extrusion dies: solids, porthole, bridge, mandrel, etc. and tools are given in an illustrated brochure.

Hydraulic Presses: 163

BIRDSBORO STEEL FOUNDRY & MACHINE CO.—A self-contained, oil hydraulic, four-column aluminum extrusion press, 2,750-ton capacity, is described with other hydraulic presses in an illustrated brochure.

Conversion Chart: 164

ENGIS EQUIPMENT CO.—This pocket reference chart converts micro inches to angles. It will make conversions to the sixth decimal point.

Multiple-Point Recorder: 165

LEEDS & NORTHRUP CO.—Technical data on the Model S Speedomax G multiple-point recorder controller assembly for two-position control, is available.

Propane Diluter: 166

SELAS CORP. OF AMERICA—Bulletin PD-1 describes diluters that accurately mix propane or butane with air to supply standby fuel.

Induction Heating: 167

MAGNETHERMIC CORP.—The extrusion of metals and low frequency induction heating are discussed in an informative brochure.

Ingot Furnace: 168

OREGON METALLURGICAL CORP.—Specifications on the Model R-1 ingot furnace, designed to melt reactive metals by either consumable or non-consumable electrode arc melting in an inert atmosphere or vacuum, are given.

Vacuum Equipment: 169

NRC EQUIPMENT CORP.—Technical data is available on the company's line of vacuum pumps, gauges, valves and other high and ultra-high vacuum equipment.

Tool Components: 170

PIC DESIGN CORP.—Master Catalog #20 lists the company's complete line of stock precision instrument components and associated tool components.

Millivoltmeter: 171

MINNEAPOLIS-HONEYWELL REGULATOR CO.—Specification sheet gives technical data on the function and operation of the Pyr-O-Volt Controller, a current-proportioning instrument.

Die Lubricants: 172

ALDRIDGE INDUSTRIAL OILS, INC.—Technical data sheet on die lubricants for aluminum and zinc die castings, that are non-staining, economical and feature no build up in the dies.

Layout Machine: 173

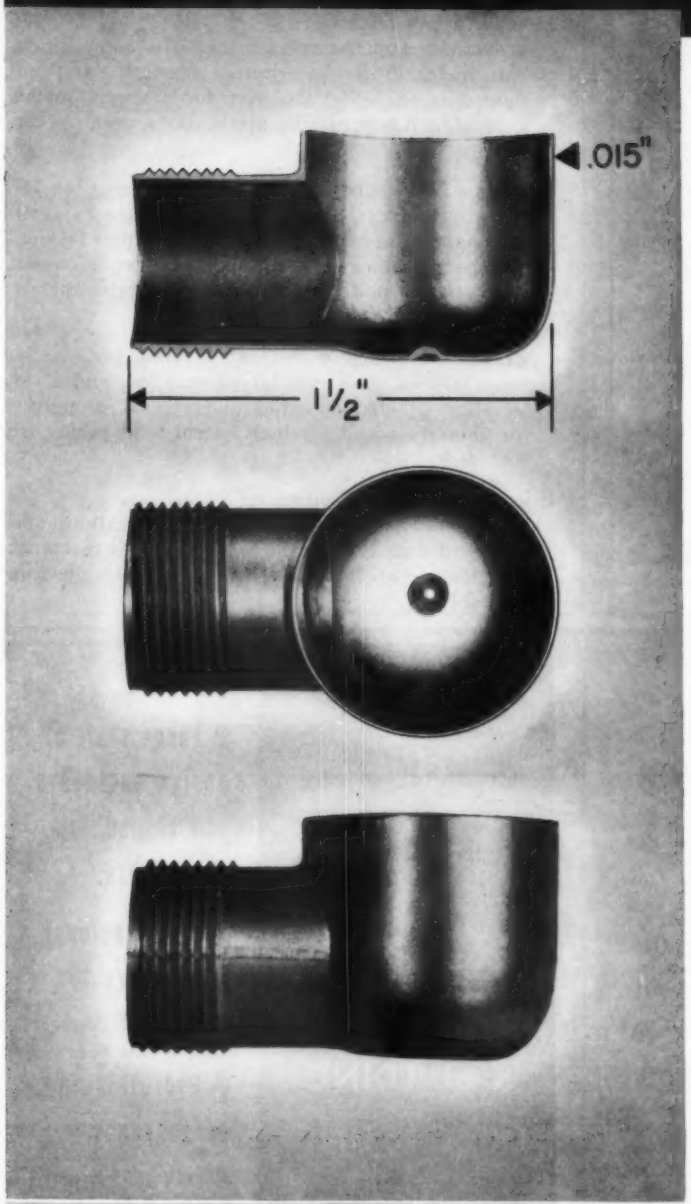
PORTAGE DOUBLE-QUICK, INC.—Technical data on this layout machine, that lays out workpieces, (castings), on 5 sides and checks inside surfaces with one setting, is available.

Machinable Carbide Die: 174

SINTERCAST CORP. OF AMERICA—Engineering data is available on a machinable carbide lamination die that out-produces a tool steel die by 25 times.

continued on page 66

IT'S LIGHTER THAN YOU THINK!



AND STRONGER, TOO, WHEN DIE CAST with ZAMAK

This thin-wall spark plug shield is a zinc die casting with minimum wall thickness of only .015".

Many zinc die castings are as thin as stampings, yet can be produced in shapes that cannot be duplicated as one-piece stampings.

More and more, engineers are learning that they can design parts for ZAMAK alloy die casting that will compete with either steel stampings or castings of the lightweight metals—and at lower cost.

THE NEW EDITION OF "END USES OF ZINC DIE CASTINGS"

SEND FOR YOUR COPY TODAY

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street · New York 38, N. Y.

HORSE HEAD PRODUCTS ®

For more information circle No. 45 on the Reader Service Card

For more information circle No. 23 on the Reader Service Card

Announcing

FIBRECOOL

THIS WATER-SOLUBLE CUTTING FLUID HAS EVERYTHING

FISKE'S FIBRECOOL will help you lower costs through heavier cuts, higher speeds and longer tool life. Produces better finishes in both cutting and grinding. It's "WORK PROVEN".

- TRANSPARENT, DOESN'T HIDE WORK
- COOLS WHILE IT LUBRICATES
- ACTUALLY PROTECTS FROM RUST
- NO FOAMING, NO STICKING, NO GUMMING

Bulletins describing Fiske's Fibrecool and other specialty lubricants and coolants, sent on request.

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METAL WORKING LUBRICANTS

FISKE BROTHERS REFINING CO.

129D LOCKWOOD STREET, NEWARK 5, N.J.

Plants: Newark 5, N. J. Toledo 5, Ohio

USEFUL LITERATURE

continued from page 64

Ejector Pins: 175

DETROIT MOLD ENGINEERING CO.—Data sheet describes form ejector pins, with hot-forged heads, that come in standard 10" lengths.

Steels & Alloys Data Card: 176

ALLEGHENY LUDLUM STEEL CORP.—The composition, base material, density, rupture strength data, and short time properties are given for 19 special metals used in high temperature applications, on a pocket-size card.

Dies Cast Direct From Expandable Patterns: 177

MANCO PRODUCTS, INC.—Engineering data is available on The Accu-Cast process for custom fabrication of mold and die components precision-cast from original patterns in almost all castable metals.

Aluminum Mill Products: 178

KAISER ALUMINUM & CHEMICAL SALES, INC.—A 24-page booklet gives general information, and a description of characteristics and typical properties for aluminum mill products. Heat-treat tables are included.

Injection Molding Machines: 179

LESTER-PHOENIX, INC.—Complete specifications and technical data is given on the company's machines that feature an internally heated vertical injection assembly.

Announcing . . .

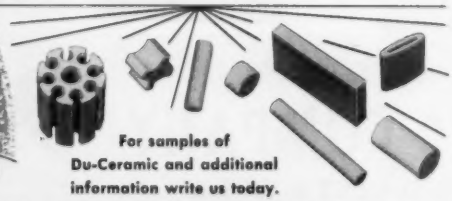
DU-CERAMIC

A special new material for investment casting cores

Big news in the ceramic industry is the development of a brand new material, Du-Ceramic, for investment casting production. Du-Ceramic has been designed expressly for achieving accuracy in precision molds. Shapes can be produced to close dimensional tolerances.

Cores made of Du-Ceramic require no drilling and other costly machining operations. The material is readily removed from the casting by leaching, using a concentrated sodium hydroxide solution.

DU-CO steatite and technical ceramics



For samples of Du-Ceramic and additional information write us today.

DU-CO CERAMIC CO.

SAXONBURG, PENNSYLVANIA

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USE OUR YEARS OF EXPERIENCE DESIGNING & BUILDING DIE CASTING DIES

- Large staff of design engineers and skilled die makers.
- 3-dimensional duplicators to 30" x 60".
- Hydrotels and pantographs, Rotary head mills. DeVleig jig mill.

For complete facilities list and further information write to:

Alliance Mold Company, Inc.

FORMERLY ALLIANCE SPECIAL PRODUCTS DIVISION, INC.

1300 MT. READ BLVD., ROCHESTER 6, N. Y.

For more information circle No. 3 on the Reader Service Card

Tool & Die Steel: 180

UNIVERSAL-CYCLOPS STEEL CORP.—Lo-Air, a cold work alloy tool and die steel for trimming and coining dies, etc., is presented with complete technical data in a 12-page brochure.

Furnace & Atmosphere Selection Chart: 181

C. I. HAYES, INC.—This data chart makes it possible to relate application requirements directly to furnace and atmosphere equipment.

Water-Soluble Cutting Fluid: 182

FISKE BROS. REFINING CO.—Fibrecool, a water-soluble cutting fluid that is said to enable heavier cuts, and higher speed machine operation, is described in technical literature.

Alloy Reference Chart: 183

LEBANON STEEL FOUNDRY—In addition to listing 55 of the most widely used cast alloys in the carbon, low alloy and stainless steel groups, this chart has a section on the design applications of each alloy listed.

Aluminum For Architecture: 184

OLIN MATHIESON CHEMICAL CORP.—This 12-page brochure gives design information and the properties of architectural aluminum alloys.

Alloy Stock List: 185

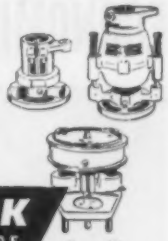
WAIMET ALLOYS CO.—The latest stock list of Master Alloys and a copy of "Metals In Brief" are available from the company.

continued on page 68

For more information circle No. 22 on the Reader Service Card

LET'S PUT OUR MULTIPLE HEADS TOGETHER!

. . . and plan your small hole drilling & tapping operation on a low cost, maximum production basis



ETTCO-EMRICK
MULTIPLE SPINDLE HEADS

UNIT-ENGINEERED *for drilling or tapping on any drill press*

No one type will do for every job. That's why we make 'em all—and the correct custom tooling for faster handling of the parts. The Ettco system is a completely integrated service; not just multiple heads with spindles reaching into the air!

Ettco engineers can tell you without obligation which type best suits your specific job. They're all easily attachable to your present drill press, tapping machine or automated special. Standardized, reuseable components mean lowered costs. Interchangeable face plates permit quick switch from tapping to drilling. Write for catalog.

Ettco Multiple Heads shown clockwise: Fixed spindle; Geared Adjustable; Knuckle-Head Adjustable

Send us a sample part or drawing for recommendations now!

Ettco-Emrick

The only complete line manufacturer of drilling & tapping equipment for the entire small hole field

See your authorized Ettco distributor

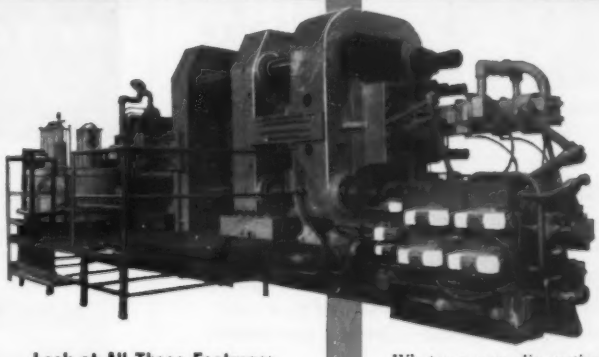
ETTCO TOOL & MACHINE CO., INC.
586 Johnson Avenue, Brooklyn 37, N. Y.

HAMPDEN BRASS ADDS 2 NEW 1000 TON DIE CASTING MACHINES

. . . LARGEST OF THEIR TYPE IN NEW ENGLAND

Here's Why Hampden Brass Can Serve You Better!

In order to improve our facilities and serve our customers even better, we have added 2 new die casting machines of 1000 ton capacity . . . in addition to our standard 400 and 500 ton die casting machines. These new machines are the largest of their type in New England.



Look at All These Features:

- **INJECTION:** 25 lbs. of aluminum 60 lbs. of zinc
- **SPACE BETWEEN BARS:** 35" x 45"
- **CASTING CAPACITY:** Up to 900 square inches of aluminum

Whatever your die casting requirements . . . from a watch case to a car door, Hampden Brass is prepared to meet your specific needs . . . quickly, efficiently and to exacting specifications. Our sales engineers are always ready and prepared to assist you in any way possible.

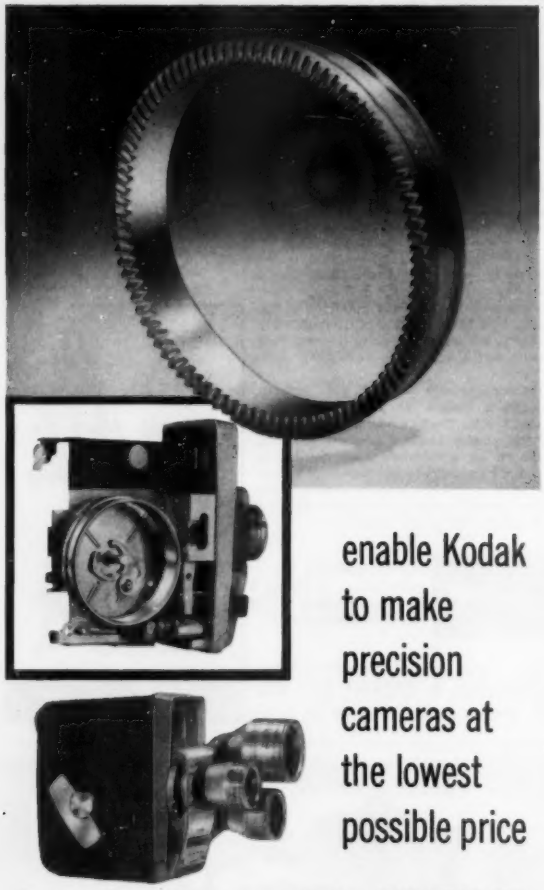
Send for brochure, "Behind the Scenes" . . . complete digest of Hampden Brass's experience, equipment and facilities.

HB

HAMPDEN BRASS & ALUMINUM CO.
Established 1903
SPRINGFIELD 1, MASS.
Non-Ferrous Castings: *Sand, Permanent Mold, Die and Structural Fiberglas*
Complete Pattern & X-ray Lab Facilities

For more information circle No. 25 on the Reader Service Card

ECONOMIES SUCH AS THIS...



enable Kodak to make precision cameras at the lowest possible price

Eastman Kodak Company switched to **BRASS POWDER METALLURGY** for the motor face gear on the Kodak Medallion 8mm Movie Camera—saving machining and gear cutting.

OTHER MATERIALS either would not take the stress of motor overwind, were too costly to machine, lacked required concentricity or generated 75% process scrap.

THE BRASS POWDER PART*... *eliminated gear cutting...reduced machining to a minimum...produced no scrap... had more than required strength...perfect concentricity ...AND LOW COST.*

*made by The Presmet Corp., Worcester, Mass.

THIS BOOKLET will assist you in evaluating this modern production method in terms of your particular needs.

SEND FOR YOUR COPY TODAY

THE NEW JERSEY ZINC COMPANY
160 Front Street, New York 38, N. Y.

For more information circle No. 46 on the Reader Service Card

USEFUL LITERATURE

continued from page 67

Temperature Indicators, Controllers: 186
WEST INSTRUMENT CORP.—Bulletin COM is a catalog digest of the company's temperature recorders, controllers, indicators, control systems and accessories.

Ductile Iron: 187
INTERNATIONAL NICKEL CO., INC.—The Engineering properties of Ni-Resist Ductile Iron are given in a 28-page booklet. The metal features high strength, toughness, corrosion resistance, and heat and wear resistance.

FINISHING

Auxiliary Tumbling Barrels: 188
WHEELABRATOR CORP.—Bulletin No. 452-D describes the Liquamatte auxiliary tumbling barrel for batch wet blasting of small parts.

Activator for Caustic Soda: 189
LONDON CHEMICAL CO., INC.—Technical data is available on Lonco Alka-Strip Booster, an activator for caustic soda that replaces wetting, dispersing and softening agents.

Deoxidizing Aluminum: 190
OAKITE PRODUCTS, INC.—Oakite Compound No. 34, for deoxidizing aluminum, describes the 6 applications for the compound in the fabrication and finishing of aluminum.

SELECT **CENTURY**
FOR SPECIAL SHORT RUN DIE CASTINGS

DIE CENTURY CASTING CO.

MODERN EQUIPMENT TO MEET YOUR DIE CASTING NEEDS

SHORT RUNS
We specialize in small quantities for both zinc and aluminum Die Castings, ranging in size from a fraction of an ounce to several pounds.

UNIT DIES
Our system of Unit Dies may easily solve your problems on small production quantities due to lower tool costs.

Consult Us on Your Requirements

CENTURY DIE CASTING CO.
2629 W. FLETCHER ST. CHICAGO 18, ILL.
TELEPHONE: IRving 8-2629

For more information circle No. 17 on the Reader Service Card

Bonding Material: 191

TURCO PRODUCTS, INC.—Bulletin gives technical data for 9 Turcoat coatings and describes their use as a bond for paint and other organic finishes.

Cleaning & Phosphating of Metals: 192

MALSBARY MFG. CO.—"How To Clean And Phosphate Metals In One Operation at Low Cost", is the title of a booklet offered by the company.

Overcomes Organic Contamination: 193

MACDERMID INC.—Technical Data Sheet No. 83 describes a surface-active liquid that overcomes the effects of organic contamination in copper cyanide plating baths which are not air-agitated.

Paint Stripping: 194

OAKITE PRODUCTS, INC.—Four different paint stripping methods are described in a technical brochure on how to strip paint.

Vacuum Metallizing Coatings: 195

BEE CHEMICAL CO.—Data booklet tells of the application of coatings for use in vacuum metallizing. Product information sheets are included.

Rinse Agent: 196

HANSON-VAN WINKLE-MUNNING CO.—Literature is available on H-VM-M Rinsoff, a rinse agent that is said to cut down on plating rejects.

Vacuum Equipment:

NRC EQUIPMENT CORPORATION—16-page product summary and price list presents a line of standard and custom high vacuum components, equipment and systems, including complete furnaces for melting, heat treating and crystal pulling. Write on company letterhead to NRC Equipment Corp., 160 Charlemont St., Newton 61, Mass.

Multiple-Compartment Barrels: 198

WHEELABRATOR CORP.—Multiple-compartment barrel finishing machines are illustrated and described. The standard components and sub-assemblies available can be combined for any application.

Acid Cleaner: 199

ENTHONE, INC.—Enthol 59, a non-flammable phosphoric acid type cleaner and deruster, can be used hot or cold and can be applied by dipping, brushing, swabbing or spraying according to technical literature.

Conversion Coating Machine: 200

HANSON-VAN WINKLE-MUNNING CO.—Convert-O-Matic, a full automatic straight line conversion coating machine operates for blackening, phosphating, bright-dipping, pre-cleaning, and pickling according to a recent bulletin.

Barrel Finishing: 201

WHEELABRATOR CORP.—"Techline Finishing Progress" is a new magazine available from the company. It presents the latest methods in barrel finishing and wet blasting.

A BIG JOB ON SMALL PARTS

Every one of these OPC castings represents time and money saved by a manufacturer. You, too, can save time and money by having OPC produce your small parts to the most exacting tolerances, whether you need just a few for experimental purposes or thousands for a production run. Our illustrated brochure shows how and why.

OPC

OHIO PRECISION CASTINGS, INC.

P. O. Box 55, Sta. A.....DAYTON 3, OHIO

Plaster Mold Castings made from

BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

For more information circle No. 47 on the Reader Service Card

QUALITY √ PRICE √ DESIGN √ CAPACITY √ DELIVERY DATE √

All things check

at CHARLES ZAPF & CO.

from the blue print to the finished die casting die. We are prepared to produce the best possible mold to meet your exacting requirements.

Our staff of experienced designers, engineers and mold makers, working with modern equipment, assures you of a job well done.

Our equipment includes the latest Keller and Hydrotel with capacity of molds up to four tons.

We are licensees of the Shaw Process for precision casting of cavities & cores in hot work tool steels.

Die Casting Dies

2425 MAIN STREET EVANSTON, ILL.

Phone DAvis 8-0333

For more information circle No. 67 on the Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

NEW GREENFIELD CO. SALES REPRESENTATIVE

MISS MACTAGGART

The SAMUEL GREENFIELD CO., INC. has announced the appointment of Miss Jane A. MacTaggart as sales representative. Miss MacTaggart will handle sales of brass, bronze and aluminum in New York state and eastern Pennsylvania. Her office will be maintained at the main company headquarters in Buffalo, N.Y.

NORRIS IS NEW PRESIDENT OF DENISON ENGINEERING

NORRIS

Former vice president and general manager of DENISON ENGINEERING DIV., AMERICAN BRAKE SHOE CO., Paul W. Norris has been named president of the division. The announcement of Norris' appointment was made by W. C. Denison, founder of Denison Engineering, and a vice president and director of American Brake Shoe Co.

MOLYBDENUM IN HEAT AND CORROSION PROOF ALLOYS

LORIA

Reuel E. Warringer, vice president, sales, of CLIMAX MOLYBDENUM CO., DIV., AMERICAN METAL CLIMAX, INC. has announced the appointment of Edward A. Loria as development manager, high temperature and corrosion resistant alloys.

Mr. Loria will coordinate material developments involving molybdenum in the area of superalloys and super-duty steels for aircraft, missiles, space vehicles, nuclear power, chemical processing and other heat and corrosion resistant applications.

WILMOT OF ALCOA RETIRES

Donovan Wilmot, vice president in charge of product sales and distribution for the ALUMINUM COMPANY OF AMERICA retired February 1st after 46 years service with Alcoa.

Lewis P. Favorite, manager of product sales since 1955 has been elected vice president to succeed Mr. Wilmot.

NORWALK POWDERED METALS JOINS PMPMA

The newest member-company of the Powder Metallurgy Parts Manufacturers Association is NORWALK POWDERED METALS, INC. Andre Blumenthal, company president, will represent the company in association affairs.

REYNOLDS ALUMINUM SERVICE

COLE

David P. Reynolds, executive vice president of REYNOLDS METALS CO. has announced the election of Albert M. Cole as executive vice president of REYNOLDS ALUMINUM SERVICE CORP., a Reynolds Metals subsidiary. The Service Corp. handles sales in the architectural and building products field.

Before coming with Reynolds, Mr. Cole was federal housing administrator. In his new position he will be responsible for developing and guiding programs for the use of aluminum in monumental, urban renewal and residential construction.

GEO. SALL APPOINTS OHIO SALESMAN

MUTH

A new sales engineer has been added to the staff of the GEO. SALL METALS CO., INC. Mr. William Muth will cover the entire state of Ohio for the company.

LOEWY-HYDROPRESS NAMES NEW SALES ENGINEER

MORLEY

Philip W. Morley has been appointed sales engineer by the LOEWY-HYDROPRESS DIV., BALDWIN-LIMA-HAMILTON CORP.

Mr. Morley, a graduate mechanical engineer, will work in the field of missile handling and launching eqiupment on land and aboard ship.

Morley has been connected, for many years, in technical and military capacities with army, navy, air force and allied agencies in the missiles, radar, chemical and nuclear fields.

ROTO-FINISH & RANSOHOFF COMBINE

Gunther W. Balz, president of the ROTO-FINISH CO. has announced the purchase of Ransohoff, Inc. In the past, Roto-Finish has been primarily a manufacturer of precision barrel finishing machinery. With the acquisition of Ransohoff the firm will have complete engineering and manufacturing facilities for all types of metal treating machinery.

ALUMINUM ASSOCIATION OFFICERS ELECTED

At the annual meeting of the Aluminum Association, M.M. Anderson, vice president of the Aluminum Co. of America, was elected president. S. D. Den Uyl, chairman of the board, Bohn Aluminum & Brass Corp., was elected chairman of the board.

LATROBE NAMES CHIEF ENGINEER

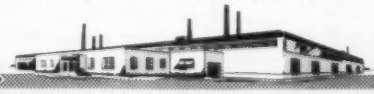
Eugene J. Hochdanner has been appointed chief engineer at LATROBE STEEL CO.

The nonferrous alloys that you cast are among the hundreds of tons of Aluminum, Brass-Bronze, and Zinc alloys that we stock . . . ready for immediate delivery anytime. Depend on the George Sall Metals Company to keep you on schedule . . . and to keep your dollars active.

PRECISION The world's only fully automated smelter!

NON-STOP SHIPMENTS The company's private fleet insures no lost hours — no lost dollars!

LABORATORY CONTROL Rigid standards for your protection!



DISTRIBUTORS OF KAISER ALUMINUM INGOTS

THE GEORGE SALL METALS CO., INC.

2255 EAST BUTLER STREET • PHILA. 37, PENNA. • Pioneer 3-2828

PRODUCERS OF: Aluminum alloy ingot, Brass and bronze ingot, Zinc base die casting alloys

For more information circle No. 59 on the Reader Service Card

ZINC AND ALUMINUM DIE CASTINGS

- **PRECISION MACHINED**
- **COMPLETE ENGINEERING AND DIE FACILITIES**
- **AUTOMATIC CHROME PLATING**

Our complete facilities, from design to finishing, enable us to meet your varied die casting requirements regardless of size or complexity.

Write to:

Wolverine Die Cast Corp.

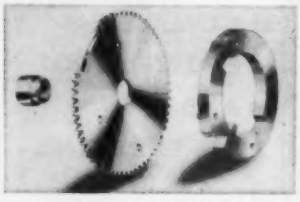
13700 MT. ELLIOTT
DETROIT 12, MICH.
FOrest 6-9675

circle No. 64 on the Reader Service Card

here's PROOF of how the GRC method cuts the cost of small parts...

Compare the methods for producing these mutilated gear, cam and bushing combinations . . . for an electrical appliance timer. (Shown actual size)

* method A

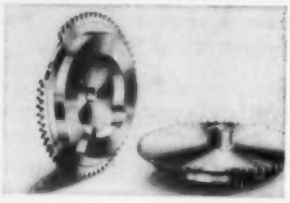


*Stamping, screw machine part, assembly

- Blanked, pierced, & extruded Cam
- Blanked & pierced Gear
- Screw Machined Bushing
- Sub-assembly: Stake Bushing to Gear
- Final Assembly: Stake Cam to Gear

5 PRODUCTION STEPS + 5 Inspections

the GRC method



One Piece — One Operation

Automatically Die Cast of Zinc Alloy

A BETTER PRODUCT
- Ready to use as cast
- Closer tolerances
- Higher uniformity
- No buckled gears & cams
- No loose assemblies
- No misalignment (gear-cam orientation . . . critical in this application)

SIMPLER PRODUCTION
- Cast and trimmed in one automatic step . . . no secondary operations
- No scrap loss

1 PRODUCTION STEP — only ONE inspection needed

NOW . . . compare these figures:

Cost/M in lots of

	100M	200M	500M	1MM
Method A	$32.50	$31.00	$30.00	$29.50
GRC Method	17.44	15.50	12.50	10.00

CLEAR SAVINGS FROM 50-60%

"BONUS FOR DESIGNERS" Only the GRC Method gives you such *complete design freedom* for small parts. It turns many "impossible-to-make-at-any-price" ideas into uniform, high quality parts . . . at lower cost. So, before you design . . . check with GRIES.

You've seen the facts . . . clear proof of how GRC's DIE CASTING METHOD offers substantial savings on your small parts. The Gries Method delivers parts of high uniformity, with close tolerances . . . ready for use as they come from Gries' automatic machines. Assembly and most other secondary operations are eliminated.

Write, wire, phone NOW for GRC's bulletin "Small Die Castings Exclusively"; send prints for quotation.

MAXIMUM SIZE: 1¾" long, ½ oz. NO MINIMUM

GRIES

GRIES REPRODUCER CORP.

World's Foremost Producer of Small Die Castings

157 Beechwood Avenue, New Rochelle, New York • NEw Rochelle 3-8600

For more information circle No. 24 on the Reader Service Card

NEW TYPE, NON-FLAMMABLE HYDRAULIC FLUID

A new type of hydraulic fluid, all-synthetic, which is lower in price and a better lubricant has been developed by MONSANTO CHEMICAL CO. The new fluid is called Pydraul A-200.

The new Pydraul is described as a formulated compound based on halogenated hydrocarbons. It has high resistance to compression, excellent lubricity and stability. Six months of field testing in die casting machines has proven the claims made for the fluid according to Richard Davis, manager of Pydraul sales.

On equipment designed for synthetic fluids it can be used with no changes. On petroleum systems, a minimum of change is needed.

VAN WINKLE TODD DIES

Van Winkle Todd, chairman of the board of directors of HANSON-VAN WINKLE-MUNNING CO. died January 15; he was 66 years old.

Mr. Todd was founder and president of The Hanson & Van Winkle Co. of Newark. In 1927 Mr. Todd's company merged with the A.P. Munning & Co. of Matawan, N.J. and Mr. Todd became president of the merged companies, Hanson-Van Winkle-Munning Co.

In 1948, Mr. Todd became chairman of the board of the company a position he retained until his death this year.

OLSON ASST. TREASURER NATIONAL RESEARCH CORP.

Mr. John I. Olson, Jr. has been elected assistant treasurer of NATIONAL RESEARCH CORP. The position has been vacant since Mr. David D. Nickerson was elected treasurer last year.

In addition to his new duties, Mr. Olson will remain as controller of the wholly-owned subsidiary, NRC Equipment Corp.

VANADIUM-ALLOYS MAKES TWO NEW APPOINTMENTS

Dr. George A. Roberts, vice president, technology, of the VANADIUM-ALLOYS STEEL COMPANY has announced two changes in the metallurgical department of the company.

R. C. Lampert will serve on the product development group and

supervise metallurgy in the heat treating dept. while E. Paul Scott was transferred to the metallurgical service staff. Both men joined the company last June after graduation from college.

ELECTRON BEAM FURNACE INSTALLED

The first commercial installation of an electron beam furnace to melt, refine, and cast special metals will be made this spring by WAH CHANG CORP. at its Albany, Oregon plant.

The furnace, designed and built by STAUFFER-REMESCAL CO., will have a rating of 225 KW. It will be capable of the continuous melting and casting of high purity ingots six inches in diameter.

Semi-production furnaces have successfully melted such metals as tungsten, molybdenum, tantalum, columbium, hafnium, zirconium, uranium, beryllium, special steels and rare earth metals.

CARBORUNDUM WILL BUILD NEW PILOT PLANT

Clinton F. Robinson, president of THE CARBORUNDUM CO., has announced that his company will build a ¾ million dollar pilot plant for its research and development division in Niagara Falls. It is estimated that from 9 to 12 months will be required to build and equip the new facility.

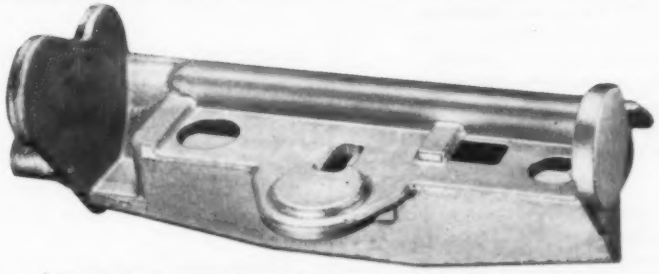
The new pilot plant will house equipment to carry the work on ultra-high temperature processing techniques through the development stages to a point where they will be ready for use by manufacturing divisions of the company.

REPRESENTS HOEGANAES ON WEST COAST

HOEGANAES SPONGE IRON CORP. has announced a change in sales and service personnel on the west coast where offices and warehouse services are located in southern California.

Mr. William F. Graden will join the Hoeganaes organization with headquarters in West Covina, Cal. Mr. Graden has had many years experience in the powdered metals industries and in ceramics.

MEETS 100% X-RAY INSPECTION



THIS ALUMINUM PERMANENT MOLD CASTING,

an aerial sextant trunnion, is made to government specifications and must pass 100% X-RAY inspection. This most exacting inspection, by Eastern, insures high quality castings — immediate user acceptance. Features of this casting include intricate details in its design and the holding of extremely close tolerances.

Combined quality and economy in a casting results from a unique combination of assets. At Eastern Casting Corp., years of diversified foundry experience are coupled with the most modern facilities obtainable . . . the results are metallurgically sound castings which meet a wide range of requirements.

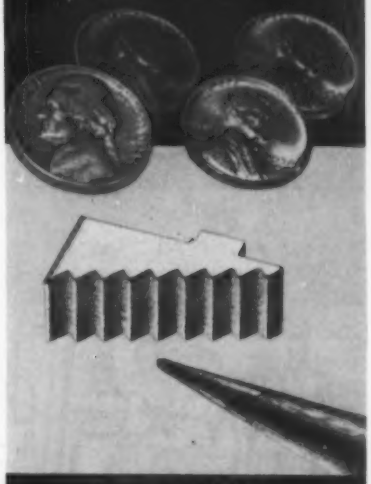
We Welcome Your Inquiries

EASTERN CASTING CORP. DIVISION
THE EASTERN MALLEABLE IRON CO.
64 SOUTH WILLIAM STREET, NEWBURGH, NEW YORK

For more information Circle No. 21 on the Reader Service Card

Only 8 Cents

. . . for this intricate Minicast part . . .



in quantities of 100,000

Here is another dramatic example of the benefits to be gained from the new Minicast precision process. In addition to an unusually low per unit cost for the part, strict specifications had to be met.

For example, the Minicast process had to provide

- an average maximum radius of .003 on the teeth
- specific tolerances of plus or minus .001
- no tolerance greater than plus or minus .003
- and produce the parts in non-machinable stellite

If you use intricate parts in similar quantity ranges, chances are the Minicast process is your answer to lower costs.

Write for this free brochure. "See us at the Engineered Castings Show —Chicago Sherman Hotel, April 13-17.

Casting Engineers DIV.

2325 NORTH BOSWORTH AVENUE
CHICAGO 14, ILLINOIS

Circle No. 14 on the Reader Service Card

LETTERS

continued from page 14

the problem of your subscriber. We will be glad to pass on information about this material to the reader. D.J.N.

We have, of course, furnished our reader with the name and address of this company who can help him. — Ed.

SHELL MOLD CASTINGS

In your January issue you have an article on shell mold castings and refer to a company, Precision Mfg. Co., as one who has facilities to cast metal in shell molds.

We would appreciate your advising their address and the person to contact relative to purchasing shell mold castings made in nickle silver alloy #412.

If they have a representative in the Detroit area, we would appreciate his name and address. — L. W. Sec.-Treas.

The information requested in this letter has been sent to the writer. — Ed.

POWDER METALLURGY DIRECTORY

We understand that PRECISION METAL MOLDING magazine prints a list of producers of powdered metal producers in the United States. If this is correct, will you please let us know where such a list can be obtained and the cost. — L.D., Merchandising Mgr.

A directory of fabricators of sinterings and of suppliers to the industry is published every year as a part of the April issue.

A copy of the 1958 directory has been sent this reader. — Ed.

DIE CASTING STATISTICS

We are manufacturers of hydraulic equipment widely used on die casting machines.

It would be very helpful to me in my work if I had an indication of the number of die casting machines, by size, which were manufactured each year. Do you publish this information? If not, do you know if it is available. — M.S., Market Research Mgr.

This particular information is published every September as a regular part of our die casting forecast issue. A copy of the September. 1958 issue has been sent. — Ed.

FINISHING DIE CASTINGS

In reference to your articles in the last issue on spray painting and barrel finishing, we are interested in both processes and would like to have the addresses of Dowst Mfg. Co. and Precision Valve. — M.S.C.

Information requested has been sent. — Ed.

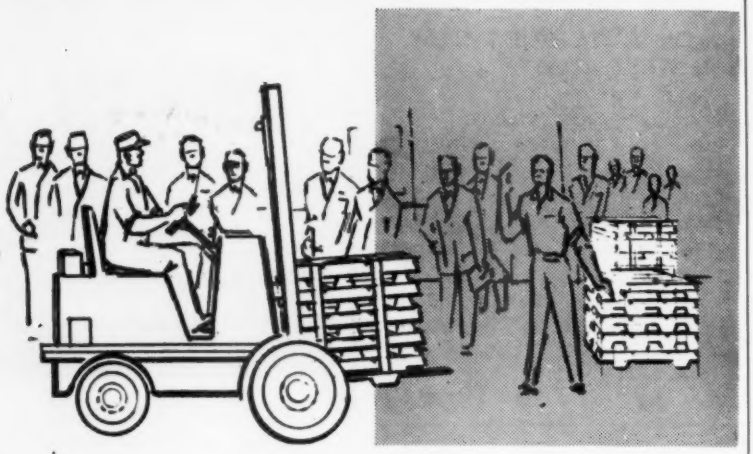
REPRODUCING ARTICLES

Our research library in San Jose, Cal., is starting an experiment in Information Retrieval which will involve microfilming selected articles from PRECISION METAL MOLDING.

One print will be made from the microfilm and sent upon request to the engineer with the understanding that it is to be used for research purposes only.

May we have permission to reproduce your documents. — J. G., Res. Librarian.

Sure — Ed.



EVERYONE GETS PALLETIZED SERVICE

(or whatever kind of service you want)

FROM HENNING

You don't need big-company equipment to get palletized service from HB&S. Our delivery trucks not only have hydraulic tailgates to drop the palletized material to sidewalk level, but also carry along a small hand-operated hydraulic lift-truck to roll the material to any point *within your plant!*

HB&S service is **personalized** to fit your needs just as HB&S alloys are specifically engineered, quality-controlled from start to finish, to meet your casting needs.

See what a difference HB&S service . . . HB&S quality make in better casting results . . . lower costs.

Smelters and refiners of aluminum, bronze, brass, zinc, lead.

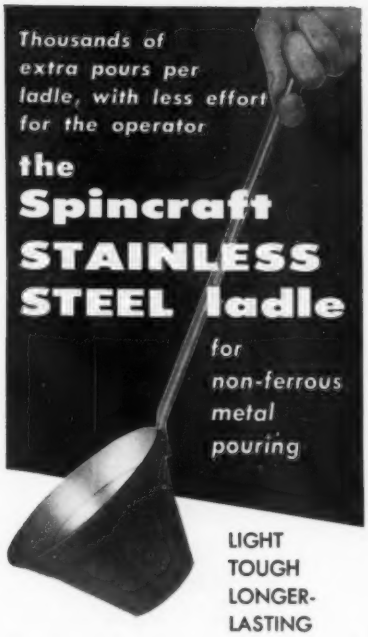
Write NOW for this FREE reference book and guide to help you in selecting your die castings alloys. It's loaded with FACTS.

HENNING BROS. & SMITH, INC.

Dependable service since 1922

91-117 Scott Ave., at Randolph St., Brooklyn, N. Y.

For more information circle No. 26 on the Reader Service Card



Thousands of extra pours per ladle, with less effort for the operator

the Spincraft STAINLESS STEEL ladle

for non-ferrous metal pouring

LIGHT
TOUGH
LONGER-
LASTING

If you pour non-ferrous alloys, Spincraft ladles will save you replacement costs and make the job much easier. Designed to reduce operator fatigue by their lightness, balance, and non-spill shape, they resist burning-through as only stainless steel with its high critical melting point can do. Spincraft ladles come in 23 sizes, from ¼ lb. to 30 lb. molten metal capacity.

- 75% lighter than cast iron ladles
- Amazingly long life
- Shot-blasted for coating adhesion
- Deep conical form makes pouring easier, minimizes spillage
- Can be used for zinc and other metals without coating
- "Whack proof" handle arc-welded to reinforced cup edge
- Built to last longer, work lighter. Let your operator use one, then try to take it away from him!

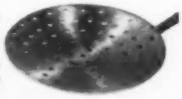
Complete handle on ¼ lb. through 9 lb. size; 10 through 30 lb. size has handle bracket stub to which proper length handle can be attached.

Also...Spincraft STAINLESS STEEL Skimmer

A skimmer that really skims! Shallow radius skims surface impurities instead of ladling as deeper-cupped skimmers do. Correct size holes prevent clogging. Short handle stubs fit common pipe and permit attachment of length and type handle you want.

IN FOUR DIAMETERS: 6 inch, 8 inch, 10 inch, 12 inch.

Spincraft ladles and skimmers are also available in low-cost mild steel.



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SKILL WILL DO IT
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Write for complete data and prices today.

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4138 West State St., Milwaukee, Wis.

Send us complete information on:

Stainless Steel	Mild Steel
☐ Ladles	☐ Ladles
☐ Skimmers	☐ Skimmers

Company .....

Address .....

City ..... State .....

Name .....

Circle No. 61 on the Reader Service Card

NEW PRODUCTS

continued from page 60

date wide variations in sizes or shapes of parts. This eliminates the need to junk or rebuild racks because of a style change. The degree of adjustment on these racks, built by SERVICE SCREW PRODUCTS CO., is continuous from .001" to 32".

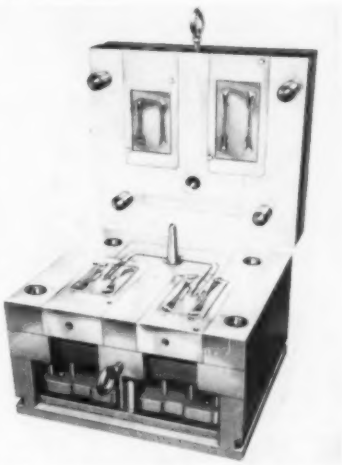
Circle No. 210 on Reader Service Card

TURBINE GRINDER
. . . for die finishing

The "imp", a single-stage high speed turbine grinder, has been introduced by ARO EQUIPMENT CORP. The unit will grind or cut where ⅛" shank mounted wheels or cutters can be used. It delivers 75,000 rpm. at normal 90 lb. airline pressure.

Circle No. 226 on Reader Service Card

MASTER MOLD
. . . is vertical position, double impression



This "Master Mold" unit die, developed by RICHARDS TOOL & MOLD CO., will handle double impression molds in vertical position. Either or both molds can be changed in a few minutes from the top through the use of eye bolts and hoisting

continued on next page

MONARCH EXPLORATORY ENGINEERING

...a new freedom for creating better end-products within production budgets

Many ideas about what can or cannot be accomplished with castings are now obsolete. Monarch exploratory engineering in finishes, surface texture, metallurgy and production methods has opened new design horizons.

Consult with Monarch engineers, on your current product or new project. They will bring you their wide experience in casting design, surface treatments and mass-production techniques that have been successfully applied to many outstanding products.

You can profit through Monarch's advanced technology. Monarch engineering consultation is available to you without obligation. Call or write today.

MANUFACTURING in MOLTEN ALUMINUM ACHIEVEMENTS

MONARCH ALUMINUM MFG. COMPANY
9205 Detroit Avenue Cleveland 2, Ohio

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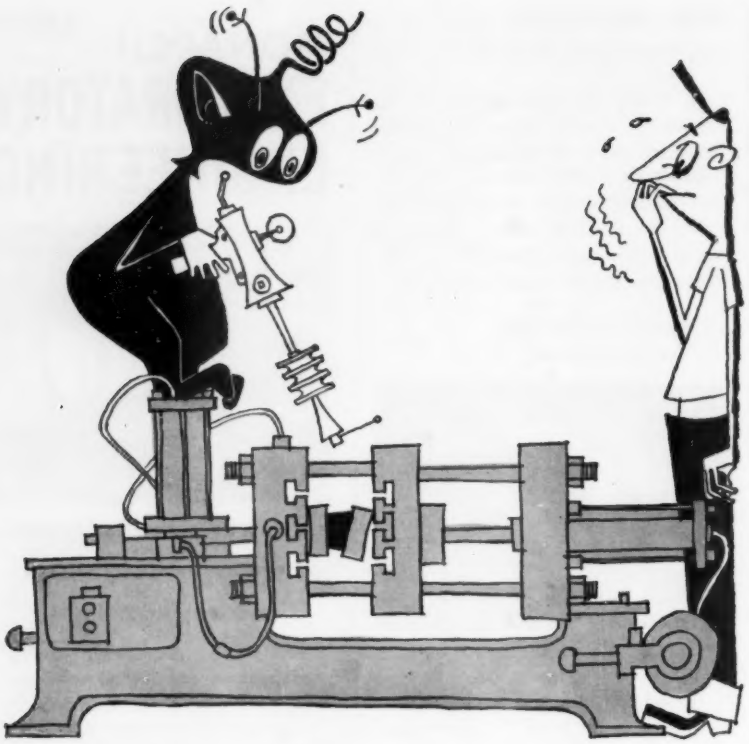


Don't Disintegrate... use Die Slick!

There *is* something new under the die casting sun. It prevents sticking, scoring and soldering on aluminum die casting. Really remarkable is that you can thin brand new 44 Die Slick with WATER *or* kerosene *or* solvent *or* white oil *or* you name it. It sounds incredible, but it's in production use in dozens of big plants.

The people who thin it with water report excellent release properties without die checking. Furthermore, they report saving lots of money because they no longer need expensive thinners. 44 thins easily with 3, 4 or 5 parts water, and it won't settle out. There's no fire hazard, either.

The people who prefer to thin it with solvents say they get better release properties than with any other compound. Either way you use it (and we suggest you try both ways) you'll be pleased. Order a trial gallon today. If you don't like it, we'll pay the bill.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,

1700 SPAULDING ROAD, DAYTON 3, OHIO

For more information circle No. 57 on the Reader Service Card

NEW PRODUCTS

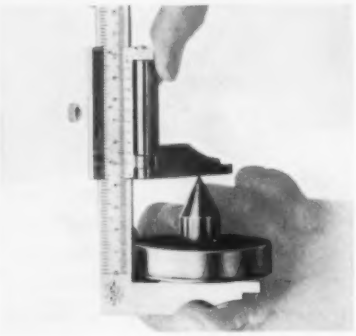
continued from page 75

equipment. Manual handling is eliminated. An advantage of the vertical position is that larger products can be molded from the unit die.

Circle No. 213 on Reader Service Card

CALIPER

. . . measures offset surfaces



THE AMERICAN & OVERSEAS TRADING CO., has announced the import of a Swiss swing jaw caliper that allows for measurement between points located on different axes. Main feature of the jaw is a hinge that allows rotation to a full 180° in a plane parallel to the measuring surface of the jaws.

Circle No. 214 on Reader Service Card

HAND TOOL

. . . is hammer, punch, magnifier & scriber

The Centa-Scribe, designed by the LANGLY CORP., is a combination hammer, center punch, magnifier and scriber. This precision tool can be used by machinists, template makers, designers, engineers, layout men, and tool and die makers.

Circle No. 215 on Reader Service Card

SAFETY GLASSES

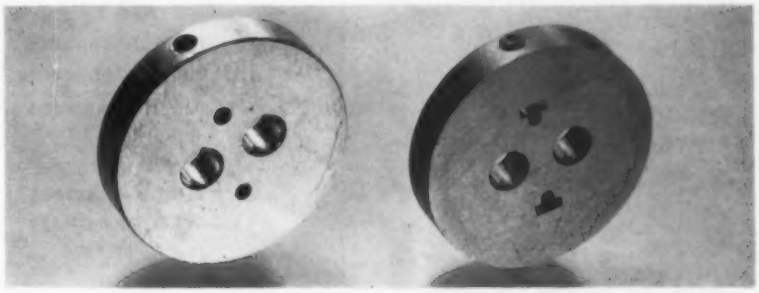
. . . feature wearing comfort, good looks

The C-20 safety glasses can withstand a blow 14 times heavier than required by Federal specification. Designed by BAUSCH & LOMB OPTICAL CO., the glasses combine long-wearing comfort and functional good looks with the protection of safety glasses. Prescription lenses can be used.

Circle No. 216 on Reader Service Card

continued on page 81

DESIGN FOR SINTERINGS



THE 50% SAVINGS was the difference between the machining operations required for the machined armature (right) and the sintered armature (left).

THE SINTERED ARMATURE, indicated by the arrow, is shown mounted in position on the solenoid valve.

Low residual magnetism lets you make . . .

Soft Magnetic Materials From Iron Powder

WOULD you throw money away? No, of course not.

That's what the engineers at the Humphrey Products Div. of the General Gas Light Co., refused to do. They had just developed a new sintered armature, for their Electropact solenoid valves, to replace one that was being machined out of B-1113 steel bar stock. The new armature represented a 50% savings in manufacturing costs. But, in testing the new armature, it was discovered that the sintering was too soft and could not withstand the sudden impact it would be continually subject to.

It is necessary here to note that the armature in the Electropact valve does not act like a plunger, as is the case with most solenoid valves. Instead, when activated, the armature is just pulled to the solenoid. It is this repeated sudden impact, of being quickly pulled to the coil, that the armature must withstand. The sintered armature could not take this repeated shock.

Keeping the potential savings in mind, the engineers at Humphrey gave the problem the old college try. As a result they devised a means of protecting the sintered armature. All that was needed was to provide something to absorb the impact of the armature hitting the coils. This was done by inserting a waffer thin disc of silicon steel between the armature and the coil. With this protection the sintered armature, with a tensile yield of 30,000 psi, can be used as a successful replacement for the machined armature which had a tensile yield of 60,000 psi. Best of all the 50% savings was retained.

Six operations were needed to complete the machined armature:

1. Rough cut to desired thickness.
2. Grind both faces.
3. Drill the 4 center holes.
4. Drill and tap 2 side holes for set screws.
5. Deburr.
6. Cadmium plate.

In the sintered armature, it was possible to form all of the center holes. This called for extremely close tolerances. The hole centers are held to within ±.001", by D.S.M.C. The remainder of the armature was held to ±.002". Three operations are required to make the armature ready for assembly. First, the faces of the armature are finished ground to ±.001". This is necessary to guarantee that both sides of the armature are flat and parallel. Following this the 2 set screw holes are drilled and tapped, then deburred. The 50% savings was the difference between the machining costs.

THE PIERCE-WALLER

AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

- CLEANS
- LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

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Plant: RAJAK MFG. CO.

Specialists in polyester impregnation of metals

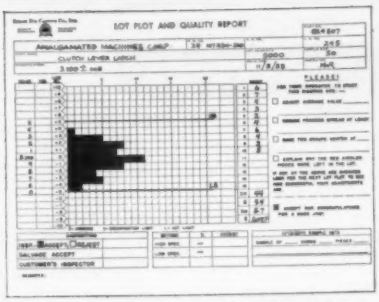
245 N. Fourth St. • Tipp City, Ohio

circle No. 50 on the Reader Service Card

For more information circle No. 62 on the Reader Service Card

STROH INTRODUCES STATISTICAL QUALITY CONTROL FOR DIE CASTINGS

DIMENSIONAL CONTROL AT STROH DIE CASTING BEGINS WITH A CHART LIKE THIS . . .



Here's what the new concept of Quality Control at Stroh Die Casting means to you

CRITICAL DIMENSIONS can be held within specified limits. Buyers who rely on statistical dimensioning to assure accurate parts for assembly are invited to consult Stroh.

LOWER INSPECTION COSTS come from simpler receiving inspection instead of full sampling of each shipment of die castings. Many manufacturers now benefit from Stroh's Quality Control.

Write for Details

IN OUR 56th YEAR

Stroh Die Casting Co., Inc.

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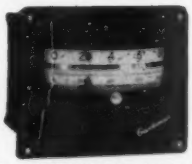

WHAT DOES BETTER TEMPERATURE CONTROL MEAN TO YOU?

It might mean greater accuracy . . . more consistent reliability . . . simplicity . . . elimination of vacuum tubes or possibly compactness or low cost. Another way, it could mean greater volume of production . . . improved quality . . . lower unit-costs. *Any* way, in many different fields, it means instruments by WEST.

Here and abroad we produce a wide selection of controllers, indicators and recorders for temperature and other variables, as well as complete systems and accessories. Our men in scores of cities offer qualified counsel. Write for Bulletin COM.

WEST Instrument CORPORATION

SALES OFFICES IN PRINCIPAL CITIES

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British Plant: WEST INSTRUMENT LTD.
52 Regent St., Brighton 1, Sussex
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For more information circle No. 66 on the Reader Service Card

DESIGN FOR
DIE CASTINGS

Die Cast It – Improve Your Product

ZINC IS THE METAL – die casting the method – a better product the result.

ELIMINATE expensive machining costs. Improve your product.

That's what the Baldor Electric Co., did when they switched to zinc die castings for their electric motor bearing lock rings. They used to have the rings sand cast. Before the castings could be assembled in the unit, they require four machining operations:

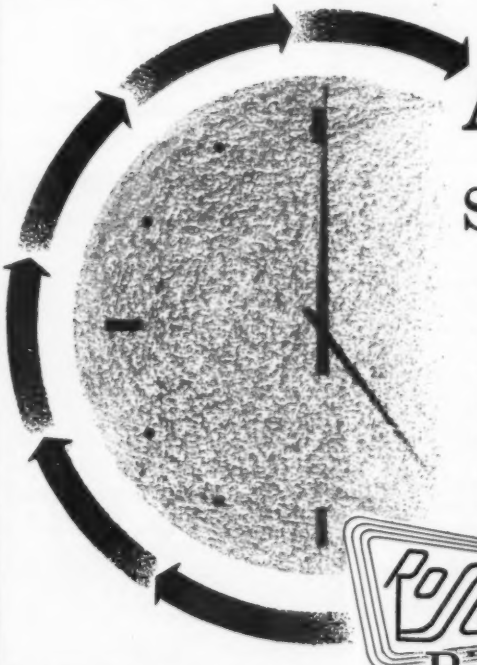
1. Face Mill.
2. Machine a locating ring groove.
3. Bore a shaft hole.
4. Drill the screw holes.

Other disadvantages of the sand casting were: 1. Porosity caused a high reject rate; 2. It was not dimensionally accurate; 3. It was rough in appearance.

The switch to die cast bearing retainer rings brought the following advantages: 1. Excellent die casting properties; 2. Corrosion resistance; 3. Close "as cast" dimensional tolerances; 4. Elimination of all machining; 5. It was good looking.

The ring is die cast to size in zinc alloy, with the bore hole and the locating ring held to $\pm 0.002''$. The cored screw holes are cast to size in the same operation.

The retainer rings are cast in 3 sizes by the A. B. Mueller Co. Each size is cast in a two cavity die at the rate of 160-180 shots per hour.



Around the Clock

Service and Production

When your production department is yelling at you to get those castings out "yesterday", you'll get the fastest service on your dies by coming to R. O. Schulz. We're set up for speed. We have the machines to make your dies, whether they're 15 tons or a few pounds, and the skilled designers and die makers to make them right. You get top quality workmanship at lowest cost when you take advantage of our specialized die and mold making facilities.

ELMWOOD PARK, ILLINOIS

Richard O. Schulz Company

DIE CASTING DIES • PLASTIC INJECTION AND COMPRESSION DIES

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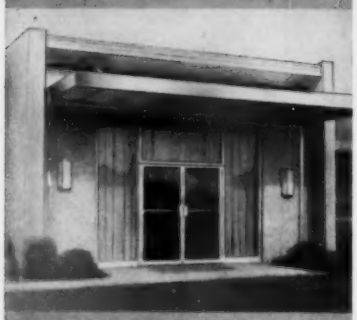
Paramount



YOUR BEST
SOURCE

Flexibility

. . . a by-word with PARAMOUNT

Large castings, small castings, varied shapes and sizes . . . thin walls, combining strength and rigidity . . . close tolerances that eliminate machining — are every day routine at PARAMOUNT.

Our designers, sales engineers, plus modern tooling and production facilities are available for your complete die casting requirements.

WRITE FOR FREE
DESCRIPTIVE BROCHURE

ALUMINUM ZINC MAGNESIUM
Paramount
DIE CASTING COMPANY
St. Joseph 22, Michigan

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This Ep Co

INVESTMENT CASTING

Made A Missile Guidance System *Better*

As originally designed, this Gimbal Outer Frame for component of missile guidance system was a brazed assembly of machined pieces and stampings. Warpage caused by brazing made subsequent machining difficult and resulted in high rejection and scrap percentage.

Redesigned for investment casting by EPCO in alloy steel SAE 8620, part proved lighter yet stronger and permitted incorporation of additional details previously impractical in a fabricated part. EPCO investment casting techniques also held concentricity of end plate holes to within .010 and parallelism between the interior surfaces to .008. End plates are 4" OD and 2¾" apart.

Again, an EPCO investment casting achieved the desired results and saved time and money in the process.

Send us drawings, for our appraisal.

Ep Co
ENGINEERED
PRECISION CASTING CO.
Freehold Road, Matawan, N. J.

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PLAST-IRON POWDERS

REPLACE WITH
B-280
Standard 80 Mesh Iron Powder

IMPROVE WITH
B-281
Phos Enriched
80 Mesh Iron Powder

ECONOMIZE WITH
B-270
35 Mesh Reduced Iron Powder

PM 9d

Send for Technical Data and Working Sample

PM
PLASTIC METALS

PLASTIC METALS
Division
National-U.S. Radiator Corporation

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JOHNSTOWN, PA.

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BOOKS

continued from page 21

1955. Additional information was obtained from prominent representatives in the field of nuclear engineering to complete the survey of the subject. Topics include: General Metallurgical Problems in the Design of Nuclear Reactors; Preparation of Metal Powders for Reactors; Powder Metallurgy of Zirconium and Beryllium; Alloying by Powder Metallurgy; New Methods for Powder Metallurgy; Safe Handling of Pyrophoric and Radioactive Metal Powders.

THE METAL THORIUM, Edited by Harley A. Wilhelm; American Society For Metals, Cleveland, Ohio, 1958. Price: $10.00

The proceedings, of the Conference on Thorium, held October 11, 1956 in Cleveland, Ohio, under the sponsorship of the U. S. Atomic Energy Commission and the American Society For Metals, are contained in this book. Some of the topics presented in this volume are: The Role of Thorium in the Nuclear Field; Thorium in Magnesium Technology; Production of Thorium Compounds; Electrolytic Refining of Thorium; Physical Constants; Crystal Structure, and Thermodynamic Properties; Electronic Structure of Thorium Metal; Mechanical Properties of Thorium and High-Thorium Alloys; and Metallography of Thorium. Photographs, charts and data tables are included.

NEW PRODUCTS

continued from page 76

TAPPING UNIT

. . . can be used 6 ways

A Lead screw tapping unit, manufactured by the PROCUNIER SAFETY CHUCK CO., can be used 6 different ways by pushing a button: for complete cycle or jog, automatic or "switch in fixture", and with foot pedal attachment for full cycle or jog. Either way it taps uniform gage fits in pitches from 20 to 96.

Circle No. 222 on Reader Service Card

Here's What Users Have to Say About MARVEL Synclinal FILTERS

SUMP TYPE (cutaway)

U. S. STEEL CO., Irvin Works Three-Stand Cold Reduction Mill—"Marvel Synclinal Filters are a part of the mill's main hydraulic system which operates Coil Cradle as well as other hydraulic machines."

P. R. MALLORY PLASTICS, INC. Supt. of Maintenance Leo Paszkiet reports—"We have one injection molding press here that was giving me a lot of trouble. In order to maintain our 24-hour-a-day schedule, I had to stop it every two or three weeks to service the filters. It was a troublesome, time consuming job but it just had to be done. Even then, the machine never seemed to reach the productive capacity I knew it was capable of. Well, I had enough of that so I pulled out the original 3 filters and replaced them with three 50 G.P.M. Sump type, Marvel Synclinal Filters. That was over 10 months ago. During all this time the machine was operating faster and smoother than it ever had before. There was no more slow down of production due to pressure loss, vibration, pump starvation, etc. On the basis of these results, we are installing Marvels on every hydraulic machine in our plant, except of course, those on which Marvel Synclinal Filters were installed as standard equipment by the manufacturer."

MANY OTHERS REPORTING SIMILAR RESULTS ARE NOW SPECIFYING MARVEL SYNCLINAL FILTERS ON ALL NEW HYDRAULIC EQUIPMENT — AND STANDARDIZING WITH MARVEL SYNCLINAL FILTERS ON ALL EXISTING EQUIPMENT.

For Dependable Protection on All Hydraulic and Other Low Pressure Circulating Systems — Investigate MARVEL SYNCLINAL FILTERS

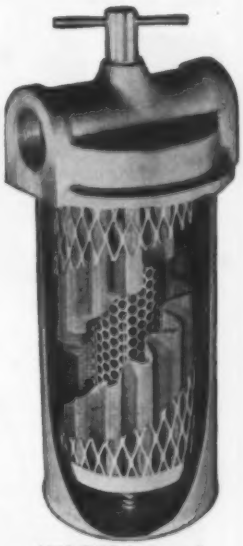
OVER 800
Original Equipment Manufacturers Install them as Standard Equipment!

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation as described in catalog. Choice of Monel mesh sizes range from coarse 30 to fine 200.

IMMEDIATE DELIVERY

Catalogs contain complete engineering data and dimensional charts making it easy to order a filter for your specific requirements and get Immediate Delivery.



LINE TYPE (cutaway)

For further information, write, wire, phone or use coupon below

MARVEL ENGINEERING COMPANY
7227 N. HAMLIN AVE.,
CHICAGO 45, ILLINOIS
Phone: JUNIPER 8-6023

MEET J.I.C. STANDARDS

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated: —
☐ Catalog #100—For Hydraulic Oils, Coolants, Lubricants
☐ Catalog #200—For Fire-resistant Hydraulic Fluids (Aqueous Base)
☐ Catalog #400—For Fire-resistant Hydraulic Fluids (Synthetic)
☐ Catalog #301—For Water

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Company .....
Address .....
City .....
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LEYDEN
WAX INJECTORS

3 OF OUR MOST POPULAR MODELS

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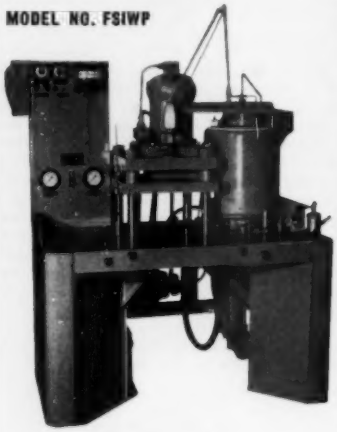
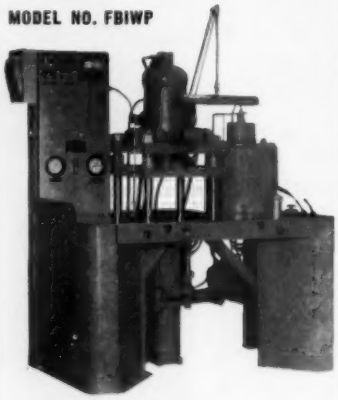


MODEL NO. FBIWP



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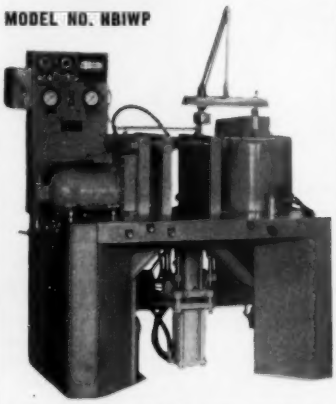


For complete details write direct to Leyden Hydraulics

Any Type or Size Unit Built to Your Specifications.

LEYDEN HYDRAULICS, INC.

1800 North River Rd. · Melrose Park, Ill.

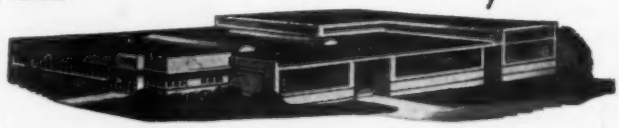
Get the results you want from DIE CASTING...

A partial list of RESULTS you can expect when you specify
MILWAUKEE DIE CASTINGS
* Less Machining
* Improved Design
* Closer Tolerances
* Smoother Finish— at lower cost
* Stronger Sales Appeal
* Faster Assembly

When you decide to use die cast parts, you expect, definite *results* in terms of *benefits* reflected in your manufacturing operations, or in your finished products. Milwaukee engineers and technicians, backed by the complete facilities of the modern Milwaukee plant, are qualified by training and experience to give you the results you are looking for . . . and more!

When you send your prints and "specs" to Milwaukee, you often get more than a quotation. You may get suggestions and proposals, when deemed useful, that will give you all the results you are looking for plus the *extra benefits* which the die casting process can give you.

Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.



MILWAUKEE DIE CASTING COMPANY

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Established 1909

Remet Powdered Metal Part cuts DESIGN and MACHINING costs for Bonney Forge and Tool Works

R. L. Huston, Chief Engineer for Bonney, says, "We went to a powdered metal part on our shifter because the cost of machining this part from steel would have been prohibitive. Also, we would have had to change the entire design of our ratchet. We contacted no less than a dozen fabricators of powdered metal. Reese Metal Products Corp. was the only establishment able or interested in tackling this problem with us."

Bonney now uses Remet shifters in seven of their ratchets. The sintered Remet parts are copper infiltrated iron.

More and more design and production men each year rely on Remet services to help solve problems.

***FREE BROCHURE** "How to Cut Precision Parts Cost with the Remet Powdered Metal Process" shows how the Reese Corp. can help you. Send for your copy today.*

Remet

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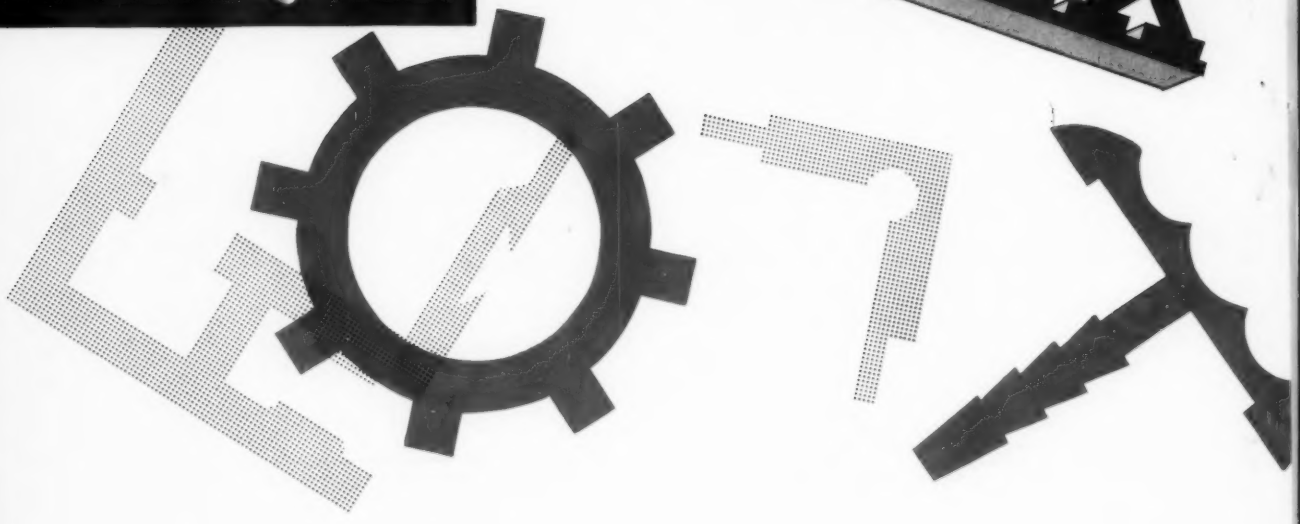

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